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Electrical World

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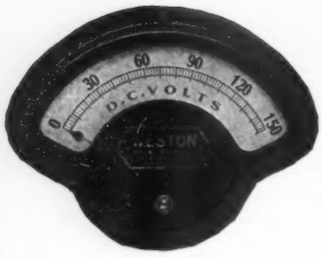

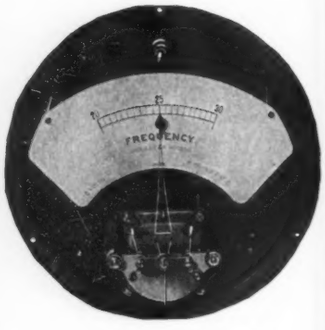

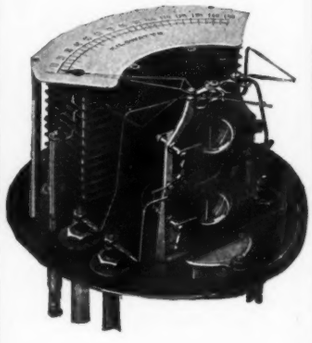

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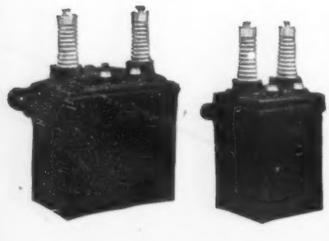

Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

Published by McGraw-Hill Company, Inc.

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Volume 79 New York, Saturday, January 7, 1922 *Number* 1

This Day of Promise

NO YEAR has ever dawned upon the world perhaps as like to that which followed on the birth of Christ as this new year we have before us now. With all the change that time has wrought, there is a striking parallel.

The generation that listened then with awe to those great tales of the bright star that stood above the manger of the babe was weary of unending war and sick of kings. The Roman Empire had taxed and ruled people to exhaustion. Hope had gone out of the hearts of humble folk and they prayed for a savior who could lead them out of bondage. They sought a temporal king and not the great creator of ideals who came. But it was the minds of men that needed the emancipation, more than their bodies, and the ideals of Christianity brought a great impulse to humanity that has carried the whole world out, up and on to where we stand today.

And here again we have a world weary of the agony of war and sick of kings and armies and borne down by the crushing burden of great navies that have sapped the wealth and strength and life of nations, the greatest, freest, most enlightened. And the wreck and devastation of a world war has this time brought about so staggering a demonstration of the curse and folly of it all that in every land with one accord men have stopped short and searched their hearts and minds and asked themselves why the old way need still endure. And they have sent their leaders on to Washington to find if possible an end to it.

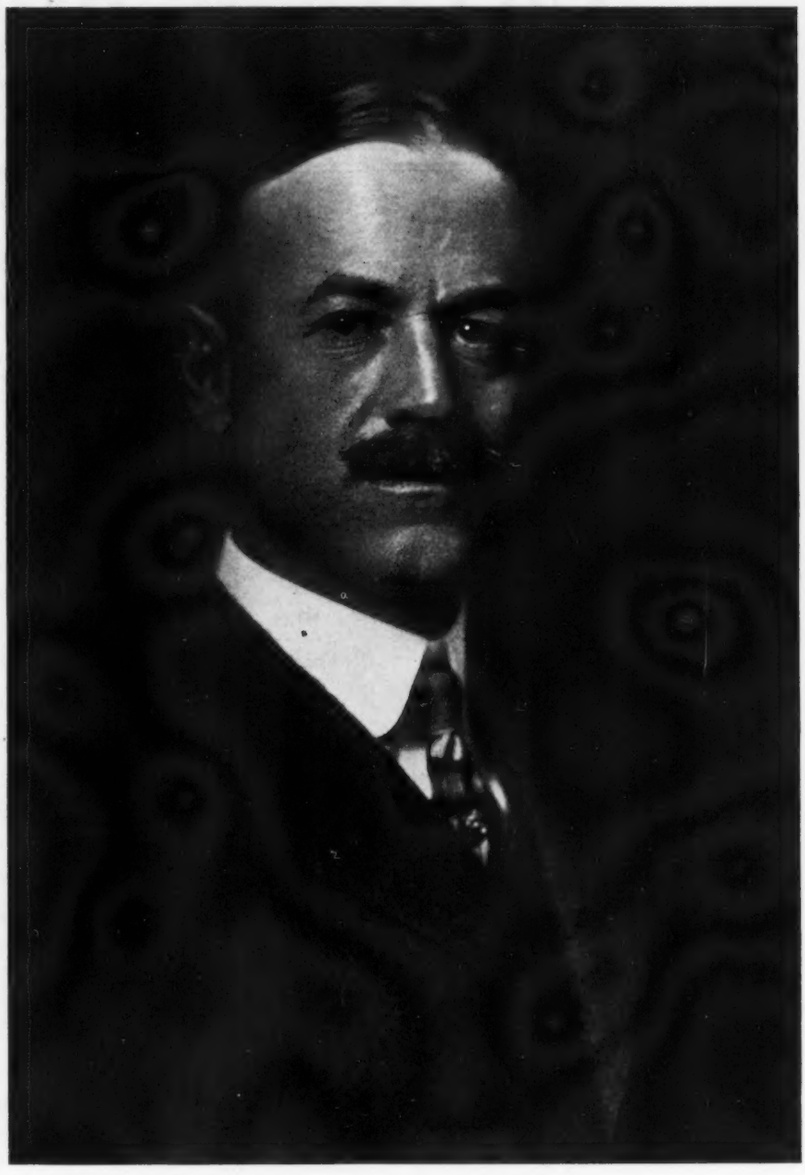
But we are not looking for a savior this time. Humanity no longer prays for a great king to lead it to some other life. Rather we reach and strive to grasp that power which will enable us to organize our own ideals into our living and to achieve salvation from these age-old evils from which we suffer by bringing reason, justice, truth and love out of their hiding places into our useful daily work.

The hope of it is that we possess this power, here and now. If we will but exert the spirit of determination, if we will but manfully maintain belief in our own works, we *can* adjust our governments and industries to our ideals. But the processes of evolution are orderly and slow. The leaders of the new era which we face today will be those men who will give guidance and interpretation as the freer, more courageous thinking of the masses conforms to the new spirit of these better times.

We are a fortunate generation, standing as we do in this great day of promise. We face an era of increasing material prosperity. And the world is setting itself to living its ideals. What a prospect!

Dwight Parker Robinson

Engineer of prominence, administrator of outstanding ability, organizer and president of one of the largest engineering and construction companies in the country.



IT IS generally conceded that the year now opening will bring in its course the beginning of the long-heralded boom in electric light and power plant construction. The water-power act is beginning to function, money is once more coming to a reasonable level, the power load is commencing to creep up, new customers are taking service, and costs of power equipment and building materials are being reduced. All these factors point to increased construction activity during 1922. Among those who will take a prominent part in the business of design and construction is Dwight P. Robinson, organizer and president of Dwight P. Robinson & Company, Inc., engineers and constructors, who possesses to a marked degree that rare combination of sound business judgment and engineering skill, and who has for more than thirty years been engaged in bringing large engineering and construction enterprises to completion with speed and economy.

Mr. Robinson was born in Boston, May 1, 1869. In 1890 he was graduated from Harvard and two years later from the Massachusetts Institute of Technology, where he obtained his electrical engineering education. After graduation he assisted in the mechanical engineering laboratory at the latter institution and in 1893 joined the organization of Stone & Webster. Within a few months he was placed in charge of the Chicago office, and in the following year constructed a power plant at Nashville, Tenn., for the Union Light & Power Company. From 1895 until 1903 he was engaged in operating different light and power properties under Stone & Webster management. The first two years he was general manager of the Cumberland Light & Power Company at Nashville, Tenn., and then for two years he was at Baltimore as general manager of the Edison Electric Illuminating Company. In 1899 he went to the Pacific Coast, where for four years he was with the Seattle Electric Company in charge of the light and power business and the development of the hydro-electric and steam-power supply of Seattle and adjacent cities.

In 1903 Mr. Robinson returned to Boston in charge of all engineering, and when the Stone & Webster Engineering Corporation was formed he was made president in charge of both engineering and construction activities. In 1912 he was admitted to partnership. During the period from 1912 to 1918 he had charge of notable hydro-electric developments at White River (Cal.), White Salmon (Wash.), Big Creek (Cal.), Falls Village (Conn.), Dundee Falls (Me.), Columbus (Ga.), and the reconstruction of the Hauser Lake dam in Montana, and also had charge of building steam stations at Seattle, Minneapolis, Boston (four), Buffalo, Bridgeport, Lowell, Houghton (Mich.), Savannah, Jacksonville, Tampa, Pensacola, Columbus, Dallas, Fort Worth, El Paso, Houston, Port Arthur, Pittsburgh, Seward (Pa.), Pittsfield, New Bedford and Bridgewater.

In 1918 Mr. Robinson gathered about him a staff of old associates and organized the firm of Dwight P. Robinson & Company, Inc., to carry on an engineering and construction business specializing in the design and construction of power stations and industrial plants. Among the first contracts of this company was one for the design and construction of the large Colfax power station for the Duquesne Light Company, where generating units of 60,000 kw. each were installed. The ultimate plant, which is designed to contain six such units, will be among the largest steam plants in the country. This plant was described in detail in the ELECTRICAL WORLD for April 12 and 16, 1921.

The company rapidly expanded, many contracts of various kinds were obtained, and the organization grew to large proportions. In 1920 Dwight P. Robinson & Company, Inc., absorbed Westinghouse, Church, Kerr & Company, Inc., by consolidation, resulting in one of the largest organizations of its kind in the world.

Editorial Comment

Electrical World, January 7, 1922

Volume 79 Number 1

Revival of the Industry During the New Year

THOSE who delight in post mortems may exercise their faculties in reflection upon the year that has passed. In virtually every business it was a lean period, marked by liquidation and with little in the way of notable scientific achievement to commend it. Historically it may loom great because of the efforts in the sphere of political action to secure essential and beneficial economic changes. But until the present world-wide discontent over social and economic conditions is also liquidated a return to prosperity and "normalcy" can scarcely be expected. The abundance of riches which we so suddenly acquired was due almost entirely to unprecedented exports to Europe. The conditions there are now more or less chaotic and in a state of flux. Petty wars rage. Non-employment and want abound. Statesmen busy themselves over questions of reparations and defensive alignments rather than in finding how to stem the financial crisis which threatens to overwhelm them. If we are to enjoy prosperity and world-wide peace, there must be stabilization in Europe. The Cannes conference on economics may help to hasten such a consummation. Certainly the Washington conference on limitation of armaments has served to reduce jealousies and fears, and it is within the range of reason to expect that money once expended for non-productive armaments when released for productive use will stimulate the revival of sound business conditions. At any rate, that is the fervent hope of all peoples and in this hope we place our confidence.

Recognized Economic Position of Electric Utilities

FOR the first time in its history the electric light and power industry has experienced the rigors of a severe industrial depression. In previous years hard times were hardly noticeable. The utilities were improving their systems and expanding so rapidly that until 1921 their history was one long succession of triumphs and achievements. At times so great were the demands for service that the utilities could not keep up with them. Last year, however, the central-station companies of the country ran into a major business depression and suffered a setback. Amazing it seems after the excellent record of over twenty years' standing in which the central-station output of energy doubled every five years; and yet it indicates not saturation—far from it—but the extent to which the electric utilities have established themselves as sources of power supply for the industrial world. While the economic position of the utilities is thus recognized, a stage has now been reached where it is essential to the industry's well-being that the electric light and power companies re-establish their commercial departments and put them actively at work canvassing for new business. A change for the better is impossible without some change in spirit and an immediate return to productive work. There must also be revived and applied the will to serve, for here and there may be heard menacing murmurings of state ownership. Except in very rare cases, this indicates a weakness in the defensive armor of the central stations, and if they are overcome they have but themselves to blame. They cannot afford to lose public support and good will, for aversion when it comes will find its own outlet for far-reaching change.

Broader National Viewpoint on Power Production Necessary

WHILE the trend of development continues along economic lines toward huge generating stations and wider and wider interconnection of systems, the time is ripe for a broader national viewpoint on power production and equipment and on their adequate and proper financing. We need leaders competent to take a long view and to think of what will probably happen because of what always has happened in like circumstances. The future power supply of the country must be dealt with on a stupendous scale, and future engineering must be as daring in conception as it is bold in execution. Standardization must also become more than a sentiment, it must be a reality. Experience and inventive genius henceforth must also travel more in harness, and to that end there should be the closest and frankest co-operation between the manufacturer and the central-station company. What form future engineering and commercial developments will take it is not hard to predict. It is the hope of every thoughtful engineer and executive that we shall soon have an industry stronger financially and economically, united in effort and purpose and determined to utilize to the utmost all of its combined skill and initiative. It is largely for the executive to determine whether future needs shall be built on the constantly shifting sands of expediency or on the solid rock of experience. If continued progress is to be ours, there must be within the electrical industry greater unity of purpose and action.

Promising Outlook for Improvement and Business Revival

THE bells that ring in 1922 should usher in a business revival that will develop gradually as the year progresses. Basic financial conditions are better than they were, and there is much solid ground now for optimism. The progress will be moderate, however, but steady. On this there appears to be very general agreement. In some aspects of trade further adjustments are looked for, making a brisk revival out of the question. Manufacturers and jobbers of electrical supplies may therefore take heart and be satisfied to plod along steadily and resolutely, confident that no general collapse of price is to be feared and that hard work will bring its reward.

Research—Past and Future

FOR progress in new developments due to electrical engineering research during the year just ended the palm is easily taken by the telephone, telegraph and radio fields. The bountiful yield of improved equipments and new methods from the adaptation to these services of the hot-cathode tube, together with the ready generation and control of high-frequency currents, is still in full flower. In the wire field multiplexing for both telegraph and telephone has been extended through the increased availability of high frequency and the development of suitable filters and kindred apparatus. By means of vacuum-tube relays and amplifiers and the facilities they offer for interchange with radio transmission both telegraphy and telephony have not only greatly extended their range but have increased notably in both flexibility and resource to meet special needs.

In the radio field recent attention has been attracted strongly to the increasing use of broadcasting telephone service. Simple and inexpensive equipment is on the market in great quantity and is being rapidly absorbed owing to the excellent broadcasting service from several stations installed at various points in Eastern states.

The improvement and construction of high-frequency alternating-current generators and their adaptation to long-distance radio goes on apace, and it is reported that a considerable number of these generators rated at 200 kw. are now in service. Noteworthy results in long-distance transmission are already reported from the beginnings of the larger international station now only partly installed on Long Island. Continuous-wave methods are replacing with good results, because of improvements in vacuum-tube generators and auxiliary equipment, the spark methods more commonly used on ships. The year has seen a number of new forms of vacuum tubes for use as detectors, relays, amplifiers and generators. One of the most conspicuous of these introduces the magnetic field as the controlling agent of the volume of electronic discharge, permitting the electrical separation of the receiving and relayed circuits.

While in the field of power transmission no revolutionary new methods have appeared as the result of research, nevertheless most important advances due to the active study of the possibilities of so-called superpower systems have been made. The suggestion of such a system for the Atlantic Coast has taken tangible shape through the report of the United States Geological Survey. Discussion on the Pacific Coast has dealt more particularly with the actual problems of transmission at 220 kv., proposed as a standard voltage.

Important progress has been made in several other directions. The question of high-voltage circuit breakers, their rating and performance, has received illuminating discussion, and it is known that an extensive series of comparative experimental studies has been made by joint co-operation of several important manufacturing companies. While the results of these experiments are not yet revealed, it is certain that they mean improvement and progress. High-voltage insulators are under constant investigation. The construction of transformers for extremely high voltages places a new instrument in the hands of those working for the improvement of insulators. The problem of built-up insulation, both for machines and for cables, has also had much light shed upon it during the year. This is one of the most difficult and obscure of all electrical engineering problems. The results attained are a clearer knowledge of the nature of the troubles which arise and of the directions in which the materials entering into the insulation must be improved.

Looking forward, the next year is certain to find further advance in all of the directions mentioned. We may expect a continuous extension of the new facilities in the radio field, a wider installation of automatic telephones and the development of printing telegraph methods. Already there are suggestions that the vacuum tube will advance into the power field. It will probably first appear as a rectifier. In the transmission field improvements in high-tension insulators may be expected with increased attention to the problem of lightning protection. Substantial results may also be expected from the several active research committees of the National Research Council, among which may be mentioned those on electric arc welding, resistance welding, electric insulation and core losses.

Trends in Our Trade and the Laws Which Bring Them

BUSINESS conditions generally throughout the world are in an active state of flux, and the electrical trade cannot escape the influence of the times. There are many changes in the making. For not only are men being called upon to readjust distorted economic relationships thrown out of balance by the war, but the very spirit and purpose of business and trade housecleaning and "straightening up" have focused close attention on many older situations where help has long been needed, although in the pleasures of prosperity the need has been disregarded.

One of the basic questions which call for thinking is the matter of the distribution of the two kinds of electrical goods—the staple wiring materials and the appliance specialties. At present jobbers are handling both, some giving their major energy and enterprise to one line, some to the other. Yet these two branches of the electrical trade are so different that it is inevitable that some wholesalers and some retailers are by temperament and inclination best equipped for specialty merchandising and some for the old-line business. And it will carry further than that. For the contractor will soon come into a larger opportunity in the wiring business. More houses must be wired and he must do it and the work of wiring must not be diverted by absorption in the details of appliance selling. This fact is going to influence a natural selection and perhaps a separation of these two classes of materials and work. And if it is necessary and desirable, it should be speeded and directed by a general policy of the industry that will guide each organization into the work that it is suited for.

Electrical men are also broadly recognizing more than ever before the importance of records and figures. We must all get further into costs as the basis of a more effective and protective regulation of credits and profits. Too much prosperity has been sacrificed in the electrical industry of recent years by misdirected selling. It is all right to talk of costs, however, and to reason in the abstract on the great need of knowing more of what it costs to manufacture, to distribute and to sell, but there is only one sure way to bring it all about. When the seller refuses to give credit to any man who cannot demonstrate to him by clear and proper records that he is not only solvent, but succeeding, a knowledge of costs

will become automatic. And our business will be lifted out of the plane of competition for orders, too often at the lowest possible price, and established on the sensible basis where the seller is engaged in building up the largest possible clientele of prosperous customers who prefer to pay full price for quality and service.

Every man who functions in a trade must render some essential service if he is to be entitled to receive a profit. If he is permitted to add this profit to the cost of the goods, it must be because he actually does something to promote the fabrication or the distribution of those goods more economically than if it were done some other way. The trade owes him nothing except for service. He has no claim for consideration save as he pays his cost in a material benefit. Thus, for instance, the practice of making small factory shipments ordered through jobbers is extravagant and bad business. Fundamentally the jobber must function as a warehouser or he should not function at all.

These problems—and the question, for instance, of who is to be the ultimate outlet for electrical appliances, the electrical or the non-electrical merchant—are not to be settled by opinions. They will be settled by the facts. They are orderly developments in the growth of a young industry which will evolve in strict accordance with old economic laws. It need not be a mystery to electrical men what is to come. It need not bring expensive disappointments or upset painfully wrought plans. The laws which trade evolution follows may be studied, and the precedents of similar experience in other industries are easily to be found. Much can, and we feel certain will, be done this year in this way.

The New Year One of Opportunity for the Manufacturer

ONCE more the electrical industry is to know the joy of building. For a score and a half or more years the manufacturers, the utilities and the trade had put their shoulders to the wheel and by hard work and unflagging enthusiasm had brought the industry up to the point where in 1914 the manufactured output was valued at $335,170,000, of which $19,963,115 was exported, and the light and power companies sold 16,782,000,000 kilowatt-hours. And then the war came along. First the Russian and then the English and French munitions contracts, and finally in 1917 the war requirements of the United States, lifted the electrical industry like many others out of its peaceful stride, and without any effort on its own part the industry found itself years ahead of what it might have reasonably looked for had the world remained at peace.

As was naturally to be expected, a violent reaction followed such a tempestuous activity. Does it mean that we must wait for the number of years that the impetus of war pushed the industry ahead of its normal growth to come and go before we can once more go forward?

If electrical men are content to sit back and bewail and bemoan as so many have the past year—particularly manufacturers and jobbers—then we shall wait. On the other hand, if all have learned that it is only on some great occasion like a war that business floats in on a platter, then we shall go ahead at once.

For five years now there has been almost no real development work. Some larger units have come forth, but little real contribution to electrical devices and equipment. Here is the opportunity. Now is the time. The salvation of the industry must lie in work, and one of the best forms that we know of is constructive work. We urge the manufacturers to get busy and bring out new devices and improve their lines.

At the same time we urge that existing lines be standardized as to size, type and parts. There was a lot of this work done under war necessity. Since then there has been much talk but little accomplishment. If standards can be agreed on and effected in a few weeks during the war, then we must confess that we do not understand why so much time should be consumed now in coming to a sensible agreement.

When one looks at the hodgepodge of motor sizes and types, at the multiplicity of insulator patterns all in style, at the quantities of different supply parts a factory that happens to have motors of different manufacture must have on hand, at the years (it almost seems as though it was from the beginning of creation) of endless discussion on standard heating-appliance plugs and connectors, at the countless number of wiring supply devices, at the special this and the special that, the odd this and the odd that—when one considers all this all that he can really think is, what an awful waste!

Talking about waste leads us to another thought—knowledge of costs. If any manufacturer thinks that he can go through the competition ahead without knowing his costs, he is sadly mistaken. The Electrical Manufacturers' Council has developed an excellent cost-accounting system. We recommend its more general use.

More refinements are necessary in selling, and one of the most important is that of market analysis. Studies are being made by the larger manufacturers of all published statistics and sales reports to determine the extent and tendency of the market; to determine whether they are holding their own, going ahead or falling behind, and why; to determine which market or territory is likely to be most fruitful for immediate future development, and so forth. The smaller manufacturer should emulate his larger brother.

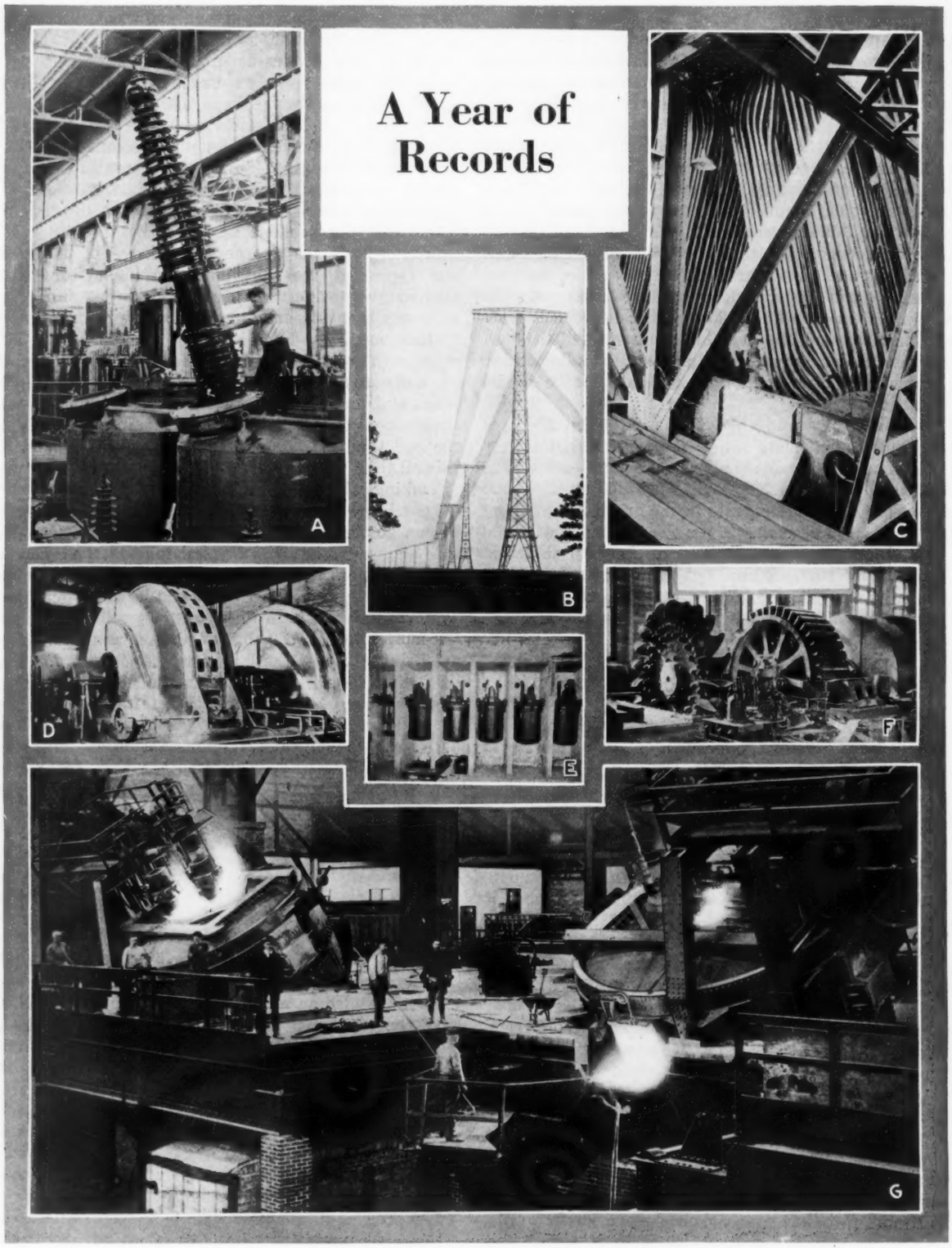
To do this studying, however, there should be more statistics available. For some reason which we have never been able to understand, the electrical manufacturer as a class is "statistics shy." This will probably wear off after a while, but in the meantime the smaller manufacturers are keeping themselves in the dark, to the advantage of the larger ones who are able to afford the money to dig out the facts.

There is also an export market to be developed. We have the surplus manufacturing capacity and the surplus money; Europe has the desire to buy but no money. The larger manufacturers can take some of these accounts and because of extensive financial background can carry them. We suggest to the smaller manufacturers that they obtain their share of this market by forming some kind of an export financing organization with sufficient credit rating to enable the participants to carry long-time accounts comfortably.

The electrical industry can look back with considerable pride upon the reasonable price advances that it made while others were profiteering. This, however, is no excuse for not liquidating prices as quickly as conditions warrant. Electrical manufacturers must make every effort possible to reduce costs.

We see the manufacturing group entering the new year in a spirit of determination and we are glad. Too much should not be expected at once. Constant plugging intelligently directed, however, will win the day. The new year is here, so, in the immortal words of the doughboy, "Let's go!"

A Year of Records



DEVELOPMENTS of the past year, while few, were for the most part superlative in character, the biggest this, the longest that and the largest something else. These illustrations are not all-inclusive, but indicate the bigness of 1921 achievements.

A—The 220,000-volt oil circuit breakers for the Southern California Edison Company have the largest terminal bushings ever supplied. B—Portion of the world's largest radio station at Rocky Point, Long Island. C—2,647-hp. boiler at the River Rouge plant of the Ford Motor Company. D—10,000-hp. frequency-changer set of the Consumers' Power Company. E—Circuit breakers for the Hell Gate plant of the United Electric Light & Power Company have the unprecedented rupturing capacity of 66,000 amp. at 13,200 volts. F—30,000-hp. impulse wheels at the Caribou station of the Great Western Power Company. G—40-ton furnaces of the Naval Ordnance Department, excelled in size only by the 60-ton furnaces being installed for the Ford Motor Company.

Sound Financing the Aim of Utilities

Continuous and Economical Financing Will Determine the Growth of Companies—Fair Return Upon Investment Must Be Defined —Bonded Debt Should Be Reduced to Half the Property Value

By W. S. BARSTOW
President W. S. Barstow & Company, New York

DURING 1922, and probably for a good many years after, the problems of the electric light and power utilities will to a large extent be financial ones. For those companies which have cleaned house, rearranged financial structures on a modern basis and freed themselves from the remnants of high finance, the problems will be greatly simplified. These problems, however, will never disappear as long as the law of supply and demand applies to money as it does to every other commodity. While, with an ever-progressing art, the methods of building up new physical properties will vary from time to time, the possibility of the continuous and economical financing of such properties will determine the extent of the growth of the industry.

There has been no time during the past thirty-five years when the demand for power has been so great as it will be in the very near future. To meet this the requirements of capital will be correspondingly great. This capital cannot be drawn from any special hidden source, but must be obtained in competition with industries of every description throughout the world. Such heavy financial requirements cannot be met unless public service commissions and utilities enter into a frank and honest understanding of the situation. It has no doubt up to the present time been necessary in many cases for commissions to pursue destructive tactics in order to compel the rearranging of financial structures created by methods of the past. But now that this has been accomplished in the majority of cases the public utilities are upon a more solid foundation than any other industry.

The time is approaching when with demonstrated efficiency of honest finance and management on the part of the utility, the future expansion will be largely in the hands of the lawmaker, who must handle the matter in a broad way and not in the manner dictated by present legal restrictions existing in many of the Eastern states.

If there was ever a time in the history of public utilities when optimism should exist, that time is now. The engineer whose attention in the past has been directed solely to the requirements of the physical structure is now with the exactness, honesty and broad vision of his profession devoting special thought to the financial part of the undertaking, so that the expansion for which he has so carefully planned may be realized.

Growth Depends Upon Credit

The existence and growth of any utility depend not so much upon its physical property and its ability to furnish efficient service as upon its credit, without which it cannot even continue, much less extend, its operations. On this credit depends the entire future of power supply. Unfortunately very few commissions realize that the majority of their decisions do not tend to improve credit, so as properly to invite economical expansion, but, on the contrary, often restrict it so as to make such expansion impossible.

To allow a "fair return upon investment" sounds well, but means little, until a definition of "fair return" is reached. The growth of a utility is in a sense beyond its control, governed as it is by the development of the art in the hands of the public. A fair return is a fair return only when it can contribute to such growth by attracting from other fields added capital to the enterprise. It has been assumed, too readily perhaps, that a rate of return can be fixed definitely and that the law of supply and demand for money can be regulated by a single governing body. This theory alone is responsible for much of the high cost of financing. Almost all public service commissions have as part of their organization an efficient engineering staff, which spends weeks and months of effort in fixing valuations and rates and in settling details of operation, but generally to no purpose, as the desired result of placing the utility in a position for economical financing is rarely attained through these efforts.

Customer Ownership Will Increase

It is this promiscuous fixing of rates of return on investment, without regard to financial conditions, that has tended to force utilities to increase their bonded debts to the breaking point, in an effort to preserve the properties, the rate so fixed often being suitable to the requirements of the lender but far below the needs of the owner. When commissions give as much time, thought and attention to the study of financial conditions as they now devote to engineering details, decisions will no doubt be more constructive. The extension of ownership of public utilities in local communities has done and will do much toward realization that rates which might satisfy the lender will not always meet the requirements of the owner or invite the increase of his interest in the enterprise.

The country-wide impetus that the local ownership plan has acquired will increase during the coming and successive years, until the local investor who is also the consumer, rather than the commission, will ultimately determine the proper rate of return. There have been in the past two distinct groups—the consumer and the investor—each demanding an advantage over the other, although each was a vital factor in the enterprise. With these groups united as they are in customer ownership, policies can be established which will result in fairness to both and which will permit not only the existence but the expansion of the industry. Future years may also develop along practical lines some well-defined plan to penalize the unprogressive utility, which has been known to enlist the aid of the commission in maintaining an obsolete plant giving inadequate service at the cost of the public.

But with the extension of local ownership only a

fractional amount of the capital necessary for new extensions is provided, and it is in the obtaining of the larger portion that problems will arise. Commissions generally must realize that rates of return to be "fair" must result in improving the credit of the utility so as to attract the investment—not the loan—of new capital to it from other fields.

FINANCIAL STRUCTURE MUST BE KEPT BALANCED

In the meantime those directing the utilities must beware lest the lower cost of money, accompanied as it will be by many inducements to borrow as in the past, again render the financial structure unstable and cause much of the history of the past to be repeated. Permanent, economical financing is that secured through the owner and not through the lender, and this should be realized at every stage of the development. Many utilities cannot accomplish the change from bonded debt to ownership at once, but every effort should be made to reduce the former as nearly as possible to one-half the value of the property. This is an all-important factor in credit.

Opinions have recently been expressed as to the extent that bonds at a lower interest rate will be issued to refund the higher rate bonds now outstanding. Transactions of this kind will, of course, depend upon the decline of interest rates to a point which would warrant such refunding, and this, with European conditions as they are at present, is problematical. The present business depression, which may continue for a period, contributes to the decline because it relieves the money market of a large demand for new capital. The amount of refunding of bonds at a high interest rate, however, promises to be comparatively small. Whatever is undertaken in this direction will be accomplished gradually over a considerable period of time and, of course, being simply a substitution, will not diminish to any extent the amount of capital available for expansion of property.

As market conditions for the sale of stocks improve, and in fact when any opportunity is offered, every effort should be made to retire bonds bearing high interest by this means. Such financing is a permanent paying off of debt, which is not the case when the debt is refunded or the time of payment simply postponed.

PROVISIONS FOR FUTURE FINANCING

That the future public utility financial situation is brightening rapidly can be seen by the events of the past year. The adoption of non-par-stock laws in the majority of states has now made possible for the first time the proper extension of the ownership of the properties. Much has been done to contribute to economy through the definite establishing of the series mortgage, providing for constant expansion of that part of the financial structure in accordance with changes from time to time in the cost of money, just as provision for expansion is made when building a new power plant.

The appreciation by the commission and the management that if the service to the public is to be protected adequate reserves must be set up to this end has restored an important stabilizing factor. The electric power industry has long since broken the confines of state boundaries, and its expansion has become of national importance in economically developing industrial life. This must result in much more rapid demands for expansion than in the past, and economical and ready financing is the foundation for such expansion.

Research Co-operation Between Universities and Utilities

BY HARRIS J. RYAN
Professor of Electrical Engineering,
Leland Stanford, Jr., University

CO-OPERATION in research between universities and utilities had a small beginning a generation ago. The last five years have witnessed a rapid increase. Difficulties and problems encountered on the road to progress by men in the utilities must always be the concern of corresponding men in the universities. Able faculty men know that in all probability the cause of the non-solution of a practical problem is some lack of knowledge of the corresponding underlying principles involved.

In recent times these matters have been mutually understood within the utilities and the universities for the decided benefit of both. Faculty men are welcomed by utility men as comrades in effort for the benefit of all. This association is costing each group much valuable time. Nevertheless, the results obtained are abundantly worth it. The men have come to know one another better. The utility man has found where to look for possible help when trouble is encountered that he is unable to overcome, and the university man has learned to whom to go for information as to the lack of knowledge of fundamentals for which he may be responsible or in regard to which he can offer effective aid.

UNIVERSITY HELP MORE APPRECIATED

Owing to frequent misunderstandings, first results have often been disappointing, particularly in the newer branches of engineering. The faculty men in many instances have lacked first-hand knowledge and experience in engineering. Pioneer graduates were small in numbers and generally unwelcome as engineers in the industries until they had "found themselves" somehow through the "school of hard knocks."

The preparedness days and participation in the great war brought the two groups together in a strong mutual understanding and determination to work for victory. Since the close of the war they have continued their united effort in "reconstruction," taking up the problems that had to be set aside for the time being and solving the problems that have been defined by the vision of a more effective use of the nation's resources. Such vision took form in the national mind as a requisite for the maintenance of a sturdy, wholesome peace.

Corporations engaged in factory production are in a position to promulgate valuable researches in all matters wherein reimbursement can be accomplished by charges made upon resulting factory products. Rarely is this correspondingly the case for the utilities. Generally speaking, a difficulty overcome by one has been overcome for all without compensation for the one and without cost to the others.

Thus there exists a wide "no man's land," littered with difficulties in the way to progress that must be taken up gratuitously by the utilities. They are finding that they can do this best by securing the co-operation of all who will be benefited.

Research co-operation between universities and utilities rests upon the firm foundation of mutual interest. It cannot properly have a commercial foundation. In research the utility and the university contribute men and equipment according to convenience. The utility

generally can afford and actually does meet the tangible expenses encountered. Researches that cannot be undertaken satisfactorily upon this basis are not considered suitable for co-operation. It is thus that research co-operation between universities and utilities has come to stay.

Review of Lighting Progress in 1921

BY S. E. DOANE
Chief Engineer National Lamp Works of General Electric Company

ONE appreciates, when reviewing the accomplishments of the year in any line, the appeal which the report of phenomenal developments or epoch-making achievements has to the reader. Such reports, however, are only possible occasionally. Their lack denotes no lack of progress.

The year has brought to the central-station companies a new appreciation of the lighting load. Had not the standard of illumination become better and the consequent lighting load increased, many companies would have found a hard situation to face in this present prolonged business slump.

NEW STORE EQUIPMENT

Illuminating engineering practice throughout the year has seen few changes in standards in any one of the general fields. Though the installing of new or revamped lighting in industrial plants was retarded, a number of plants have given thoughtful attention to their lighting designs. In the commercial lighting field, although expenditure for new equipment has been slow, the lighting requirements do not follow business conditions nearly so closely as in the industrial, and more sales effort has been directed toward this field during the past year. New units have been developed for store and office applications, the tendency being toward the use of totally inclosing units of either the direct or semi-indirect type, dustproof, and so constructed that the maintenance expense is minimized. New show-window lighting equipment has been developed within the year with which it is now possible to secure both color and spotlight effects.

Noteworthy advances have been recorded in sign lighting. The year has seen the introduction of new 25-watt and 50-watt vacuum-type sign lamps designed to bridge the gap between the old style low-wattage lamp and the high-wattage daylight and clear gas-filled lamps.

The problem of satisfactorily solving the automobile head-lighting problem and the increasing density of automobile traffic with its attendant toll of accidents have made the consideration of highway lighting imperative. Installations of a special highway lighting unit are being made in different localities.

Street-lighting practice has undergone no radical changes during the year. The result of one survey indicates that about 18 per cent of traffic accidents is due to poor illumination. As these considerations become established the demand will be for higher values of street illumination. Larger lamps are already listed, including the 15,000-lumen (1,500-cp.) and the 25,000-lumen (2,500-cp.) lamps. The rating of street series lamps has been changed from a candlepower to a lumen basis. The present system of nominal rating gives the candlepower as one-tenth of the lumen output. This nominal rating of candlepower will be dropped as soon as practicable.

Residence lighting in the past was left to develop much as it would of its own accord, owing to the imperative demands of other fields for directive effort. The home owner is dependent upon the fixture dealer, who heretofore has often considered pleasing design rather than the desirable illumination as the chief aim. Talk of "lighting effects" is becoming more general, and the tendency is toward more intelligent design to satisfy both the fixture manufacturer and the lighting engineer. A more directive effort is being made to obtain the proper application and use of lamps so that unwise combinations of lamp and fixture will before long be eliminated.

PROGRESS IN PURE SCIENCE

In the realm of pure science painstaking determinations of color, temperature and brightness relations of various illuminants have been reported. Work relative to illumination intensities and their relations to the working eye and upon speed of vision and other related factors has added guideposts to the path of illuminating engineering practice.

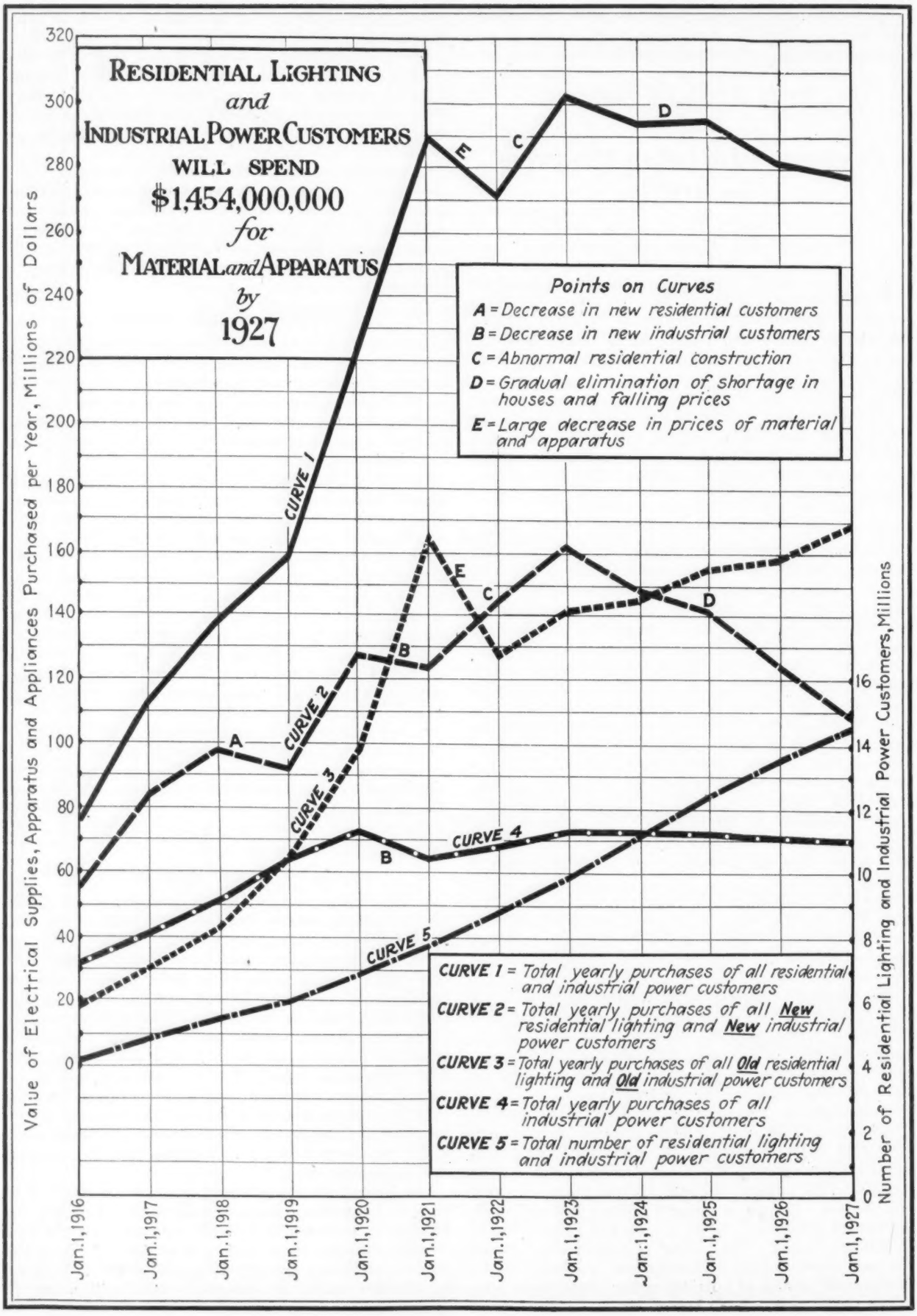
On Jan. 1, 1921, the photometry and testing of incandescent lamps was put on a new basis. Heretofore the efficiency of lamps was designated by watts per candle, which varied in magnitude with the inefficiency rather than with the efficiency. The new standard of lumens per watt is a direct measure of efficiency and conforms with the lumen ratings which have been published for several years. The institution of the lumen method of photometering has necessitated changing from the established method of rating vacuum lamps in terms of horizontal candlepower to a spherical basis, and a change of all large lamps to a lumen output basis. This change does not include miniature lamps.

A new method of evaluating lamp quality has been effected which is obviously fairer than the old method of establishing the useful life to the period where the candlepower depreciated to 80 per cent of the original. The new method considers three factors, namely, the whole life, the mean lumen output and the mean efficiency or mean lumens per watt.

LIGHT, NOT LAMPS, MUST BE SOLD

In the coming year one of the most important duties of the lighting industry will be to bring jobbers, contractor-dealers and central-station companies more closely together and bring home to them that electrical goods must be sold to the customer in terms of so much light and not as so many sockets, so much wire, so many lamps and so on. In the year just past a large number of lighting demonstrations, which are the best means of emphasizing the fact that it is light that is sold, have been installed in many cities, and this work will go on with increasing vigor. Wherever these demonstrations have been organized there has been an increase in the standard of lighting, expressed in terms of foot-candles, and a resultant increase in lighting load for central-station companies.

The important research work planned for 1922 has to do with determining even more accurately than now the number of foot-candles of light necessary for the best possible efficiency under various conditions. Tests of the relation of light to vision will continue, and it is hoped to discover additional material which will result in exact rules for good lighting.


RESIDENTIAL LIGHTING
and
INDUSTRIAL POWER CUSTOMERS
WILL SPEND
$1,454,000,000
for
MATERIAL and APPARATUS
by
1927
Points on Curves
A = Decrease in new residential customers
B = Decrease in new industrial customers
C = Abnormal residential construction
D = Gradual elimination of shortage in houses and falling prices
E = Large decrease in prices of material and apparatus
CURVE 1 = Total yearly purchases of all residential and industrial power customers
CURVE 2 = Total yearly purchases of all New residential lighting and New industrial power customers
CURVE 3 = Total yearly purchases of all Old residential lighting and Old industrial power customers
CURVE 4 = Total yearly purchases of all industrial power customers
CURVE 5 = Total number of residential lighting and industrial power customers
Value of Electrical Supplies, Apparatus and Appliances Purchased per Year, Millions of Dollars
Number of Residential Lighting and Industrial Power Customers, Millions
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
0
2
4
6
8
10
12
14
16
Jan. 1, 1916
Jan. 1, 1917
Jan. 1, 1918
Jan. 1, 1919
Jan. 1, 1920
Jan. 1, 1921
Jan. 1, 1922
Jan. 1, 1923
Jan. 1, 1924
Jan. 1, 1925
Jan. 1, 1926
Jan. 1, 1927

Value of Domestic Lighting and Power Customers as Purchasers of Electrical Supplies and Apparatus*

Residential Lighting Customers in United States, Jan. 1, 1915, to Jan. 1, 1922.

Year	Total Customers At End of Year	Increase During Year
1915	4,006,300	571,400
1916	4,626,400	620,100
1917	5,241,000	614,600
1918	5,744,800	503,800
1919	6,517,600	772,800
1920	7,465,900	948,300
1921	8,467,600	1,001,700

The number of residential lighting customers is based on surveys made by the Electrical World in 1920 and 1921 in which complete reports were received from electric light and power companies representing about 65 per cent of the total installed generator rating of the country. The last two months of 1921 were estimated by the companies reporting.

Estimated Residential Customers in United States, Jan. 1, 1922, to Jan. 1, 1927.

Year	Total Customers At End of Year	Increase During Year: New Dwellings Wired	Increase During Year: Old Dwellings Wired
1922	9,498,600	531,000	700,000
1923	10,677,600	479,000	700,000
1924	11,856,600	479,000	700,000
1925	12,915,600	359,000	700,000
1926	13,854,600	239,000	700,000

A recent survey by the *Building Age* indicates that the equivalent of 1,328,629 new houses is needed at once. It is assumed that this house shortage will be eliminated by 1927, in accordance with the following construction schedule: 30 per cent during 1922, 25 per cent during 1923, 25 per cent during 1924, 15 per cent during 1925, and 5 per cent during 1926. The census indicates that an average of 270,000 new dwellings are built per year to take care of increased population. On account of restricted immigration it is assumed that 200,000 houses per year will be constructed from 1921 to 1927. This figure must be added to the house shortage. It is assumed that 90 per cent of these new houses will be wired for electrical energy. The Electrical World survey indicated that of the 1,001,700 new residential lighting customers during 1921, 700,000, or 70 per cent, could be classed as "old dwellings wired." It is assumed that 700,000 old dwellings will be wired each year from 1921 to 1927.

Estimated Potential Value of an Average Residential Lighting Customer as a Purchaser of Electrical Supplies and Appliances

Year	New Customer (First Year): Wiring and Fixtures	New Customer (First Year): Appliances	Old Customer (Per Year)
1915	$56.71	$5.74	$3.82
1916	78.37	7.13	4.75
1917	84.73	8.70	5.80
1918	87.75	12.40	8.47
1919	85.85	18.80	12.50
1920	93.00	30.70	20.40
1921	82.00	20.30	13.52
1922	77.00	19.30	13.30
1923	73.00	18.20	12.10
1924	68.30	17.30	11.53
1925	64.90	16.40	10.53
1926	61.60	15.60	10.40

Cost of wiring houses includes retail cost of wiring and fixtures only. Estimates for 1921 were obtained from twenty-five representative light and power companies for both house wiring and appliances and the average of those estimates was taken. House-wiring figures for 1915 to 1920 inclusive were obtained by a careful study of costs of wiring and fixtures, with due regard for weight of various items. Definite appliance figures were obtained for 1915, 1919, 1920 and 1921. Figures for 1916, 1917 and 1918 are estimated from a study of appliance manufactures. It is assumed that old customers will purchase per year appliances valued at two-thirds of the value of appliances purchased by new customers. While it is known that the prices of certain supplies have reached a low level, yet prices of other supplies and appliances will undoubtedly decrease further, and it is assumed, therefore, that subsequent to 1921 prices will fall at the average rate of 5 per cent per year.

Estimated Value of All Residential Lighting Customers as Purchasers of Electrical Supplies and Appliances

Year	New Customers	Old Customers	Total
1915	$35,650,000	$13,120,000	$48,770,000
1916	53,000,000	19,000,000	72,000,000
1917	56,500,000	26,850,000	83,350,000
1918	50,380,000	44,350,000	94,730,000
1919	80,750,000	71,800,000	152,550,000
1920	92,450,000	133,000,000	225,450,000
1921	102,330,000	101,000,000	203,330,000
1922	118,200,000	112,600,000	230,800,000
1923	107,400,000	114,900,000	222,300,000
1924	100,900,000	123,000,000	223,900,000
1925	86,100,000	125,000,000	211,100,000
1926	72,500,000	134,400,000	206,900,000

Potential Value of an Average Industrial Power Customer as a Purchaser of Electrical Supplies and Apparatus

Year	New Customer (First Year): Wiring, etc. (Per Installed Motor Hp.)	New Customer (First Year): Motors and Apparatus (Per Installed Motor Hp.)	Old Customer (Per Year) (Per Installed Motor Hp.)
1915	$ 8.66	$10.60	$1.10
1916	11.90	11.70	1.60
1917	13.00	13.50	2.10
1918	13.20	15.30	2.25
1919	13.40	16.70	2.30
1920	14.20	19.40	2.50
1921	12.50	16.50	2.00
1922	11.85	15.68	1.90
1923	11.26	14.90	1.81
1924	10.68	14.17	1.72
1925	10.13	13.48	1.63
1926	9.63	12.80	1.55

All unit costs for industrial plants are based on installed motor horsepower. Cost of wiring industrial plants includes retail cost of wiring materials and fixtures only. Estimates for 1921 were obtained from twenty representative light and power companies. Wiring figures for 1915 to 1920 were obtained in same manner as for residential lighting customers. Motor and apparatus figures are based on estimates received and cost of motors from 1915 to 1920. It is assumed that in 1921 old customers spent $2 per installed horsepower for supplies and repair materials, and figures prior to 1921 are based on price of fuses and wire.

Estimated Value of All Industrial Power Customers as Purchasers of Electrical Supplies and Apparatus

Year	New Customers	Old Customers	Total
1915	$20,200,000	$6,710,000	$26,910,000
1916	30,200,000	11,440,000	41,640,000
1917	38,200,000	17,700,000	55,900,000
1918	42,100,000	22,200,000	64,300,000
1919	47,400,000	26,500,000	73,900,000
1920	32,800,000	32,300,000	65,100,000
1921	41,000,000	27,800,000	68,800,000
1922	43,800,000	29,180,000	72,980,000
1923	42,250,000	30,680,000	72,930,000
1924	40,200,000	31,920,000	72,120,000
1925	38,120,000	32,850,000	70,970,000
1926	36,250,000	33,800,000	70,050,000

Summary of Value of All Residential Lighting and Industrial Power Customers as Purchasers of Supplies, Appliances and Apparatus from 1921 to 1927

Year	New Customers	Old Customers	Total
1922	$162,000,000	$141,780,000	$303,780,000
1923	149,650,000	145,580,000	295,230,000
1924	141,100,000	154,920,000	296,020,000
1925	124,220,000	157,850,000	282,070,000
1926	108,750,000	168,200,000	276,950,000

Total 1921 to 1927.....$1,454,050,000

*Figures do not include wiring and appliances for stores, hotels, theatres, halls, etc.

Achievements in Electrical Equipment

Past Year Witnessed Important Accomplishments in Design and Application—Records in Waterwheels, Oil Switches and Transformers—Redesign of Boilers—Extension of Automatic Control and Electric Heat Applications

By ALLEN M. PERRY
Engineering Editor ELECTRICAL WORLD

WHEN the business conditions of the past twelve months are borne in mind, the year is noteworthy as a period of marked development in electrical and closely allied equipment. A large number of manufacturers have reported new products or important improvements in existing equipment, but some are not yet ready to announce them publicly. There have also been diversified applications of existing equipment to new or relatively untouched fields. All of this indicates that electrical manufacturers have not been oblivious to the needs of the industry, nor have they been affected by the reluctance to carry on development work which characterized many other industries in 1921.

NEW RECORDS IN WATERWHEELS

As might be expected because of the increased interest in water-power development, high-tension transmission and continuity of service, the equipment which has been developed has been chiefly for these purposes. However, it has not been confined to these fields.

In the hydro-electric field the principal progress has been in the development of larger-size prime movers, higher-head reaction turbines, double-runner impulse wheels, high-speed propeller-type runners for low and medium heads, draft-head regainers, and a consideration of inverted turbine mountings with upward discharge. Prominent among reaction turbines are the 55,000-hp. wheels for the Hydro-Electric Power Commission of Ontario and the 40,000-hp. units for the Mount Shasta Power Corporation. The former, which are designed to operate under a head of 305 ft., were officially started on Dec. 28 last. The Mount Shasta wheels are designed to operate under 421-ft. head and are the largest high-head reaction turbines built so far. The two vertical-shaft 22,500-hp. Francis type turbines put in operation during the year at Kern River No. 3 by the Southern California Edison Company operate under an effective head of 806 ft., the highest attempted so far with this type of wheel. However, plans are now under way to install a still larger turbine for still higher head at Big Creek No. 3, rated at 35,000 hp. and 825-ft. head. By 1924 the Portland Railway & Light Company expects to have an 860-ft. head reaction wheel installed at its Oak Grove plant, the unit to be rated at 27,500 hp.

Two of the largest impulse-wheel-driven units in the world, rated at 30,000 hp. each and operated under 1,008 ft., were installed in the new Caribou station of the Great Western Power Company during the past year. These units consist of two overhung wheels mounted on each side of the generator. In the coming spring it is expected to install two 44,000-hp. impulse wheels operating under 2,495 ft. head in the Balch power house of the San Joaquin Light & Power Corporation, thus establishing a new record.

While a high-speed propeller-type runner for low and medium heads was available in 1920, another was developed during the past year. Owing to the relatively large diameters of these runners the outflow velocity is not excessive, and for that reason the runners can be applied not only to low heads but also to medium heads in the neighborhood of 60 ft. to 70 ft. without resulting in excessive draft head. As the head is increased the discharge velocity from the runner increases so that eventually these runners would have to be located at the tailwater level, or even below, to prevent excessive draft head. To avoid the inaccessibility and the costly excavation required for such construction, it has been suggested by one company that the turbine be inverted so that the water will discharge upward.

Advances have also been made in the past year in the design of draft tubes, for regaining the energy of discharge. Still another important development is the conduit spillway, one type being developed by the Alabama Power Company and the other by the Consumers' Power Company of Michigan.

REDESIGN OF BOILERS AND IMPROVEMENTS IN ECONOMIZERS

One of the most important changes in boilers has been the redesign of the Stirling type, which has made their manufacture a better shop proposition and adapted them to higher ratings without priming. The chief changes have been to raise the front and rear drums to the same elevation as the center drums and the transfer of the steam nozzle from the center to the rear drum. Furnace construction has also been improved by the development of a new bonding tile which prevents inward bulging of the furnace walls. The design of large coal-fired cross-drum boilers has been carried to the point where operating data have been obtained which will establish the general relations between heating surfaces, furnace volume and rate of fuel combustion giving maximum steam output with minimum slagging difficulties and deterioration of furnace brickwork. These relations and similar information about heavily loaded cross-drum boilers used with other fuels have been employed in designing large high-pressure boilers.

The designs of steel economizers have been improved so as to utilize the counterflow principle to better advantage. In one new type the tubes are connected to horizontal headers, the tubes leaving one header being pitched to enter the next higher header on the opposite side. Another type of economizer has also been designed to be installed as an integral part of each boiler. The pressure parts of this economizer are all steel, the feature being an exterior of cast-iron rings similar to those in a well-known type of superheater.

A very interesting development in superheaters is their adaptation to mounting in the combustion chamber, where they are exposed to the radiant heat of the furnace. This arrangement assures high superheat

without change in the construction or baffling of the boiler, facilitates cleaning and inspection and imposes the minimum draft losses and pressure drop.

The largest multiple-retort underfeed stoker which has been developed has been installed during the past year at the Colfax plant of the Duquesne Light Company. In the field of powdered-coal combustion it is interesting to call attention to the recent installation at the River Rouge plant of the Ford Motor Company, where provision is made for burning gaseous, liquid or solid fuels in the same furnace, either simultaneously or separately. Blast-furnace gas is used as a basic fuel. When the supply is inadequate the fluctuations are made up with powdered fuel, tar being used occasionally.

Attention has been given to the electrical operation of high-pressure steam valves, one manufacturer having expended considerable money and time in determining the adaptability of various valves to such operation. To obtain more extensive data the prime movers committee of the National Electric Light Association is planning to conduct some extensive tests at the Essex plant of the Public Service Company of New Jersey.

Although there has been no increase in the size of steam turbines, it is interesting to point out that a second 70,000-kva. cross-compound turbine has been installed at the Colfax station of the Duquesne Light Company. Single-shaft turbines of 43,750-kva. (35,000 kw.) rating have also been installed during the past year, notably in the new Hell Gate station of the United Electric Light & Power Company, although there is no apparent tendency to go to higher ratings in such units.

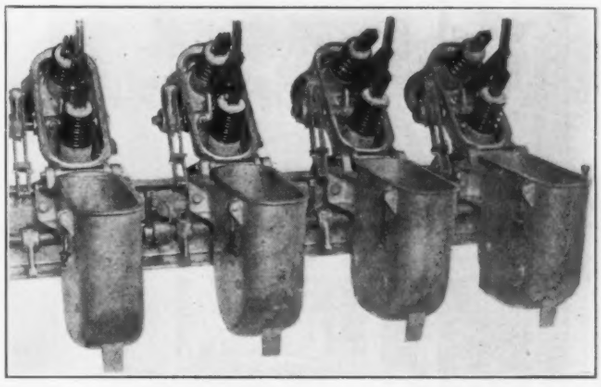
No marked development in turbine-driven generators has been reported, although there have been some advances in hydro-electric units. For instance three 45,000-kva. waterwheel generators have been installed for the Chippawa development of the Hydro-Electric Power Commission of Ontario and two 35,000-kva. generators for the Mount Shasta Power Corporation. The latter are rated at 11,000 volts, 60 cycles, 257 r.p.m., and have the distinction of being the largest 60-cycle waterwheel-driven generators that have yet been built.

Oil Switches of Unusual Voltage and Current Ratings

The building of generating stations of large capacity in the East and Middle West and the preparation for 220,000-volt transmission on the Pacific Coast have called for some marked developments in oil switches of unusual current and voltage-rupturing ability. For the Hell Gate station of the United Electric Light & Power Company oil circuit breakers have been built having a rupturing capacity of 66,000 amp. at 13,200 volts, this being the largest rupturing capacity for which switching equipment has so far been provided. In this station and the Calumet station of the Commonwealth Edison Company all phases are segregated to prevent the possibility of phase-to-phase short circuit. In the latter the switching equipment is mounted in tiers, the parts belonging to separate phases being in separate tiers. The lowermost equipment comprises the oil circuit-breakers, the middle section the disconnecting switches, and the top the main operating mechanism. Proper sequence in opening and closing is obtained by means of interlocks. In the Hell Gate station the arrangement is a little different. While the phases are still separated, the circuit breakers and corresponding interlocked disconnecting switches are on opposite sides of a wall, with the operating mechanisms on a floor above.

Excellent opportunity for the display of ingenuity has been afforded in the design of oil circuit breakers for the supervoltage lines on the Coast, among which are those of the Southern California Edison Company, the Pacific Gas & Electric Company and the Great Western Power Company. One manufacturer reports that the oil circuit breakers were built on standard lines, the only difference being in the general dimensions made necessary by the high voltage. The height of the 165,000-volt breakers from the bottom of the tank to the top of the bushings is 16 ft., the total length of the three units is 32 ft., and the weight of the complete apparatus is approximately 25 tons. The total weight of one make of 220,000-volt breakers with oil will be 202,000 lb.

Developments in breakers of smaller rupturing capacity have been made by another manufacturer, who reports four new types of breakers, including one having a maximum rupturing capacity of 12,000 amp. per phase at 15,000 volts and another intended for the control and protection of small motors up to and including 5 hp., 550 volts. The units are very compact, the first, according to the manufacturer, being small enough to fit into almost any cell formerly occupied by an oil circuit



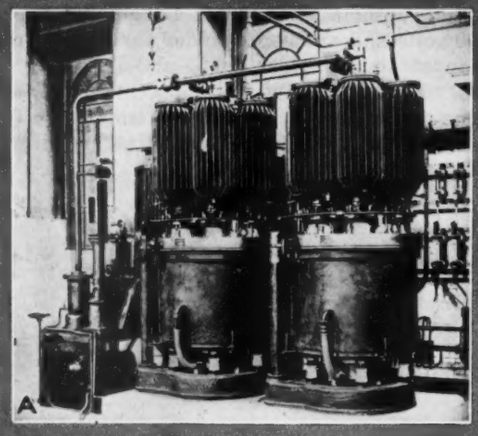
COMBINATION END BELL AND DISCONNECTING SWITCH

breaker having an interrupting capacity between 1,200 amp. and 2,000 amp. at 15,000. A feature which this manufacturer is embodying in new oil circuit breakers is the double tank with resilient support to absorb mechanical shock incident to rupturing of heavy short circuits. The secondary tank serves the purpose of a retainer for the hot oil which is spilled during short circuit and for the cooling of gases usually emitted under such conditions.

Although the truck-type switchboard has been used for several years in industrial plants and for primary service to large consumers, it is in the last year chiefly that it has been applied inside the electric service company's generating stations and substations. Notable among the installations are those of the United Electric Light & Power Company and the Hartford Electric Light Company. In these installations considerable benefit accrues through the compactness, reduced hazard to life, ease of inspection and reduced cost of installation. A distinctly new type of high-tension air-break switch has been placed on the market which, it is claimed, will break any possible ice formation and will not stick because of dust or corrosion.

During the past year one company has made available what is known as a mercury-type overload relay, as well as a phase-failure and phase-reversal device. Another company has developed apparatus for indicating phase sequence, which will be useful in metering and in power

Innovations of the Past Year Suggest Unusual Possibilities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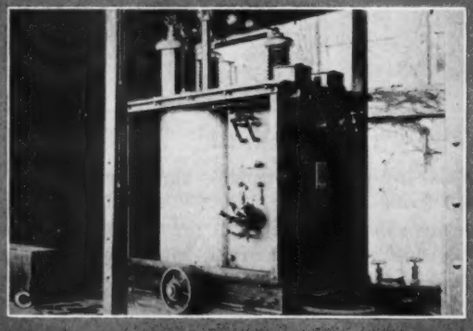
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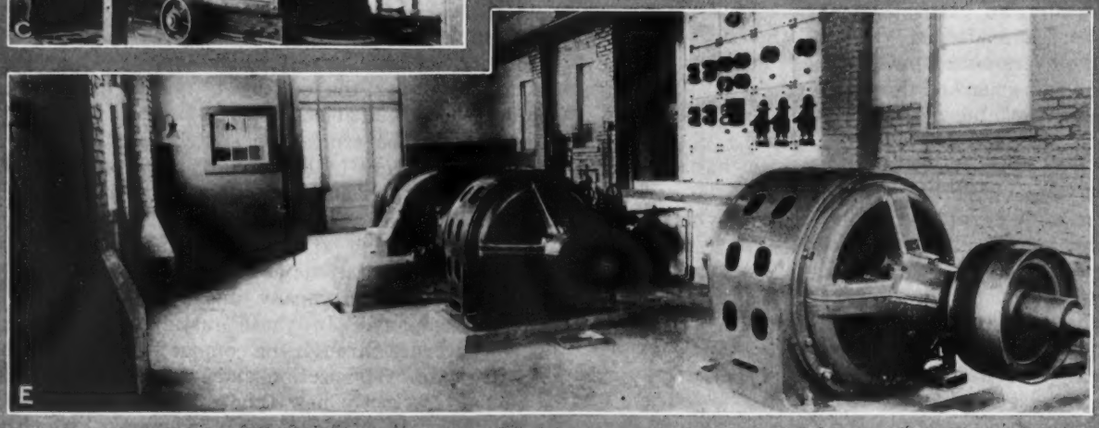
D


E

ACHIEVEMENTS of 1921 have not been confined to establishing records in size and rating. Some have been along relatively new lines. A—Steel-clad mercury arc rectifier rated at 500 kw. B—Loud-speaking telephone capable of addressing entire population of United States if closely assembled. C—Kenotron for burning out cable faults, just one of its possible power applications. D—Truck-type switchboard being applied inside electric service companies' stations. E—Attendantless induction generator station.

circuit testings. The mercury-type overload relay consists of a heating coil surrounding a tube of mercury. The main line current is carried through the heating coil, and in case of overload sufficient heat is generated to cause the mercury to boil and open the circuit controlled. The phase-failure and phase-reversal device is somewhat similar in construction to the induction-type meter, but is so constructed that an interaction between fluxes and current of two magnets produces torque.

IMPROVEMENTS IN BUS INSULATORS AND DISCONNECTING SWITCHES

Several developments have been made in bus insulators and disconnecting switches, one company reporting that it has developed busbar and wire supports with universal interchangeable fittings. These units are furnished in three standard voltages—7,500, 15,000 and 25,000 volts. A single-post type of insulator that will withstand a cantilever test of 10,000 lb. was also designed to meet the exacting requirements of the 500,000-hp. station of the Hydro-Electric Commission of Ontario. Still another manufacturing company reports that it has designed extra-heavy unit-type busbar supports for stations of large capacity. Single insulators with a cantilever strength of 8,000 lb. are available, and three-unit supports with a cantilever strength of 20,000 lb. have been designed.

New types of locks for disconnecting switches have been designed on the basis of data obtained from tests made in a large power station in the East. Locks for strain-type disconnecting switches have been brought out which will allow the suspension insulators to vary 3 in. or more and still have a positive lock. This is extremely important where the insulators supporting the switch are subjected to extremes of temperature. For operation on circuits energized at 80,000 volts and above this company has also developed extremely rigid disconnecting switches by ruling one or more grooves along the switch blades, except at the extreme end where the blades make contact with the switch clips. In addition, it has developed two new lines of disconnecting switches which can be operated in three-phase units and locked either in an open or closed position. Furthermore, the switches are so flexible in mounting that they may be supported in the horizontal or a 45-deg. inclined position with overhead or underslung mounting.

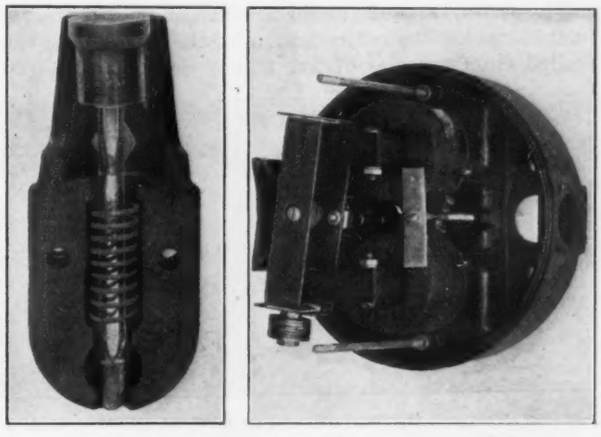
To operate any of the switches mentioned above the company has developed a motor-operated mechanism which can be controlled from the operator's office, where indications will be given of the position of the switch. In addition, the switch has the necessary safety lock to prevent accidental opening.

New types of top-connected end bells have been designed for installation outdoors with provision for easily connecting the leads to the bell without running the risk of water leaking into the bell and cable proper. As an addition to this line of apparatus, combination end-bell and disconnecting switches with the switches mounted integral with the end bell have been devised.

The latest type of lightning arrester brought to the attention of electric service companies is the flash-rod lightning arrester, which involves a porcelain tube covered with granular material that serves as a multigap of large capacity. The manufacturers claim that it has the same discharge capacity as the electrolytic lightning arrester and greater discharge capacity than the low equivalent or multi-gap arrester.

Transformer designs have kept pace with the increase in transmission voltages, units rated at 16,670 kva. and 220,000 volts having been developed for the Pacific Gas & Electric Company, and units rated at 8,333 kva. and 220,000 volts for the Southern California Edison Company. In addition, 23,600-kva. transformers have been installed for the Duquesne Light Company. The 16,667-kva. units are the largest high-voltage, single-phase transformers of the core type which have ever been constructed. Both these and the 8,333-kva. units, although designed by separate manufacturers, have cross-connected windings, with the line terminal in the middle of the coil stacks. This construction gives ample creepage distance to ground along the supporting and insulating cylinder and makes a saving in the height of the core. The methods of ventilating these transformers are also interesting, provisions being made for circulation of the oil through the cores. Another feature of these high-tension transformers is the method of insulating the windings. Means for externally changing tap connections inside transformers have been an additional improvement.

For lower-voltage circuits one manufacturing company reports that it has adopted a double magnetic circuit with elliptical coils for single-phase and three-phase units, this and other features giving greatly improved characteristics for distribution work. The entire winding, including high-tension and low-tension coils, is an integral structure, the contiguous part being cemented together to prevent disintegration of the insulation. In the three-phase units the use of the double magnetic circuit requires the use of five-legged cores, two being auxiliary legs having no windings. This company has also developed a rugged weatherproof positive-acting service for indicating overload. This can be placed in the cover or the side of the transformer. It gives its signal by the relative displacement of two indicating fingers so that the previous condition of the transformer may be detected from the ground. Several other overload indicators have also been developed.



MERCURY TYPE OVERLOAD RELAY AND PHASE-FAILURE OR PHASE REVERSAL RELAY

Few manufacturers are willing to announce the methods which they have followed for adapting insulators to supervoltage lines, but in general the methods involve the use of combined arcing and grading rings. These devices materially improve the voltage distribution of the insulator ring as well as protect it from damage by arcs in case of arc-over. A new manufacturer in the insulator field has developed some insulators on the basis that a definite relation should exist between

the dimensions of various insulators for different voltages.

The extension of high-voltage transmission, accompanied by the necessity for improved voltage regulation, has resulted in the extended application of synchronous condensers of considerable size, among which may be mentioned the 20,000-kva. units for the Pacific Gas & Electric Company.

AUTOMATIC STATION AND SUBSTATION CONTROL

While automatic control has been employed for several years in the railway field, it is only recently that it has been extended to generating stations, Edison service feeders, alternating-current feeders and industrial plant service. Among the automatic generating stations which have been installed during the past year may be mentioned that on the Deerfield River at Searsburg, Vt., and that of the Blue River Power Company at Seward, Neb. The Deerfield control provides for starting and stopping of the units by time switches and is designed to make the best use of a somewhat intermittent water supply. The plant at Seward, Neb., is also automatic. The Kansas City automatic Edison substations comprise the largest system of automatic stations for this service in the world. The entire system of the city will be controlled from a series of five automatic substations fed

PROPELLER TYPE WATERWHEELS FOR LOW OR MEDIUM HEADS

through radial network feeders. The Drifton (Pa.) automatic substation of the Lehigh Valley Coal Company is a recent example of the application of automatic control to industrial service, although it has also been applied to steel mills and industrial plants.

PROGRESS IN LIGHTING

The year has been marked by several installations of modern lighting systems, the tendency being away from multiple-unit standards except in "white-way" districts where more than one unit per standard may be desired. While the gas-filled lamp has been installed extensively, the luminous-arc lamp is not disappearing by any means and is being installed where extremely high intensity coupled with low intrinsic brilliancy is desired. A recent example of luminous-arc lamp installation is that at Salt Lake City. The use of a globeless gas-filled lamp is also a development of the past year, a notable installation being at Rochester, N. Y. The reflecting surface is such that all the light is sent down on the street, and glare is avoided. A new type of highway light consisting of a double nest of parabolic reflectors was also installed during the past year on the Albany-Schenectady road with very satisfactory results.

Among other developments in the lighting field have been the standardization of mill-type vacuum incandescent lamps with coiled tungsten filaments and lamps of similar construction in blue-glass bulbs for sign lighting service, the adoption of a new form of specification for large incandescent lamps by the Bureau of Standards, the introduction of at least three new types of dust-proof semi-indirect lighting units for offices and commercial lighting, and the connection of street-lighting systems to residential lighting secondaries. The design of quartz-type mercury-vapor units for direct current has been improved and an alternating-current burner has been developed. Considerable advance has also occurred in higher-powered search-lamp design.

Scientific investigations have been made to determine more exactly the difference in speed with which the eye can function under high and low levels of illumination and under lighting of different spectral quality. Tests reported this year indicate that an increase in output of approximately 10 per cent can be obtained by an additional cost for lighting of 1 per cent of the payroll. Systems providing 10, 15 and 20 foot-candles of general illumination are no longer unusual. Some engineers are now advocating a minimum allowance of two watts per square foot in wiring factory buildings to provide ample lighting capacity, whereas a few years ago only one-quarter or one-half of this would have been considered sufficient. An investigation of night traffic accidents in thirty-two cities indicated that 17.6 per cent could be attributed to insufficient street lighting. The crime rate in a district in which "white-way" lighting was installed decreased 8 per cent after installation during a period in which the number of crimes in the remainder of the city increased 54 per cent. The characteristics of road illumination produced by automobile headlamps were determined as a basis for establishing standards of practice and to assist in the perfection of automobile lighting systems.

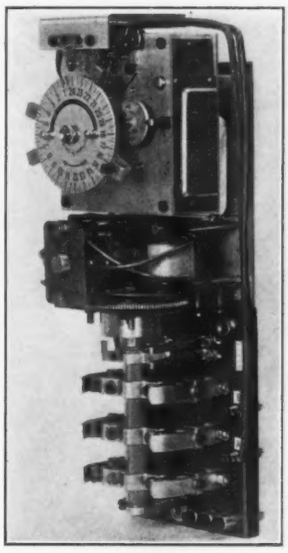
ELECTRIC HEAT APPLICATIONS EXTENDING

In the field of electric heat application not only has new apparatus been developed but the field for existing devices has been greatly enlarged. For example, a new brass furnace rated at 1,500 lb. was brought out which works on the muffled-arc principle. The largest furnace by far to be considered up to the present time is a 60-ton furnace rated at 9,000 kva. which is being constructed for the Ford Motor Company for melting cold scrap or refining hot metal only.

Electric heat has been applied to nearly every process from baking of japan on shoe eyelets to the heat-treating of the largest ingots and heavy forgings. The past year marks the installation of electrical equipment for heating the air of the entire plant of the Canadian Cotton Company, Milltown, N. S., and for baking bread in Risher Brothers Bakery, Cleveland, where 40,000 loaves have to be turned out every day. The largest electrically heated car-type furnace yet installed is that of the Sociedad Española de Construccion Naval, with a rating of 60 tons and 720 kw. This was made by an American firm at Madrid, Spain, and measures approximately 10 ft. x 20 ft. x 6 ft. Among other developments in the heat application field are the development of an improved riveter, the demonstration of the feasibility of arc-welding alloy steel and the effectiveness of percussive welding. With the idea of making the automatic welding head available for work that was impracticable hitherto, a device known as the semi-automatic welding head has been developed.

In the motor field, much has also been done in the design and application of motors to industrial purposes not extensively electrified hitherto. For instance, in

the steel industry a new frequency-converter type of alternating-current, adjustable-speed roll has been installed for the Scullin Steel Company. An interesting application has been made of individual motor drive for operating run-out tables at the Sharon Steel Hoop Company, Sharon, Pa. A motor-driven reel for cold-roll strip has been installed at the Superior Steel Company, Carnegie, Pa. Two electric reversing blooming-mill drives have been installed at the Bethlehem Steel Company's plant at Harrisburg, Pa., and at the plant of the Atlanta Steel Company, Atlanta, Ga. A reversing-mill installation remarkable for its size—namely, 8,000 hp.—was made during the year for the Lackawanna rail mill. This horsepower capacity is said to be highest for any electric reversing drive in the world. What is claimed to be the first adjustable-speed alternating-current drive for plate-glass grinders has been installed by the Allegheny Plate Glass Company. In the textile industry individual motor drive has been applied successfully for the first time to the revolving flat cotton cards at the Mason Tire & Rubber Company's plant, Kent, Ohio, and a notable rubber-mill application has also been made at the New Cumberland (Md.) plant of the Kelly-Springfield Tire Company.



ELECTRICALLY WOUND AND SPRING OPERATED TIME SWITCH

The application of built-in high-speed induction motors to various woodworking machines, grinders and planers has also been a noteworthy development of 1921.

The application of built-in motors has been made possible largely by the development of an induction frequency-changer set which generates frequencies as high as 300 cycles. The new planer drive was developed to overcome the troubles caused by planers overtraveling. Boring of oil wells by means of rotary drilling jigs is another application which has been perfected in the course of the year. A new type of vertical motor has been designed for silk spinners, and successful installations have been made at various plants, including the Standard Silk Company of Phillipsburg, N. J. During the past year the largest lift and turnover type of car dumper in the world has been installed at the docks of the Western Maryland Railroad in Baltimore. A new development in mine locomotives has been the tandem locomotives built for the Hillman Coal & Coke Company, among others. The complete locomotive can be controlled from either unit, or each unit can be operated separately. For use in industrial plants a valuable development has been the introduction of an automatic starter for synchronous motors by which they may be started as easily as induction motors.

To managers of industrial plants which are using a large number of fuses each year it will be interesting to know that a low-price safety-type automatic circuit breaker for direct-current and alternating-current circuits has been developed which serves the dual purpose of line switch and fuse. It cannot be closed under overload and is instantaneous in action, although time-lag relays and low-voltage relays can be applied. It is being made in ratings from 2 amp. to 60 amp. with 50 per cent overload capacity.

During the year a pulp grinder regulator has been developed which will automatically maintain a constant load on large motors driving pulp grinders. Two new varieties of control apparatus and individual contactors have been brought out, one being known as the voltage-drop system of control for direct-current motors, and the other being a bent-frame type of series contactor. The voltage-drop control system, which controls the accelerating contactors, is operated by the voltage drop across the motor-starting resistor, so that it also serves as a current-limit control.

Time Switch and Battery Improvement

One of the most interesting developments in the field of time-switch control is the introduction of an electrically wound device, capable of performing up to four operations, adjustments being provided for temperature, change in lengths of months, etc. This device is made for currents up to 300 amp. and voltages up to 6,600. In the lower voltages it has a quick make-and-break drum contactor and in the larger capacities it involves an oil switch. The actuating spring as well as the clock spring are wound by a small synchronous motor, overwinding of the springs being prevented by an ingenious mechanical arrangement.

One change made by a battery manufacturer should considerably reduce the liability of internal short circuits. This is an arrangement whereby the negative and positive plates are supported by separate ribs.

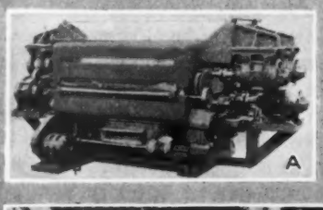
In the wire field probably the most interesting development reported is an all-rubber insulated and covered cable that will not kink or abrade, cannot be easily cut or otherwise damaged and will lie smooth when laid on the floor. As a means of facilitating the use of electricity in the home the new outlet which is being made by at least eleven manufacturers should be of considerable value. With this device enough outlets can be provided for all possible uses, without the necessity of fixtures for all of them. Connections can be made by simply plugging in new types of plugs, also made by these manufacturers, so that fixtures may be readily changeable or detachable.

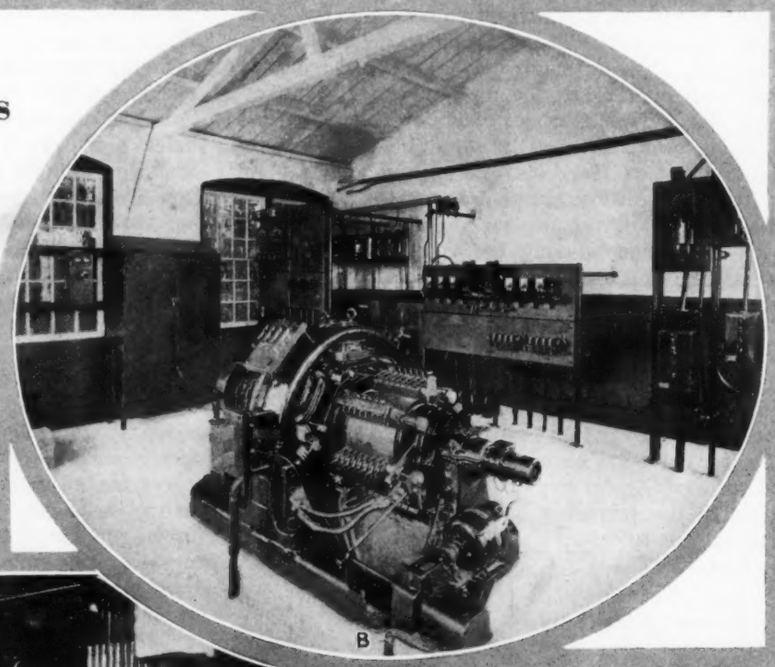
Light Delivery Vehicle Development

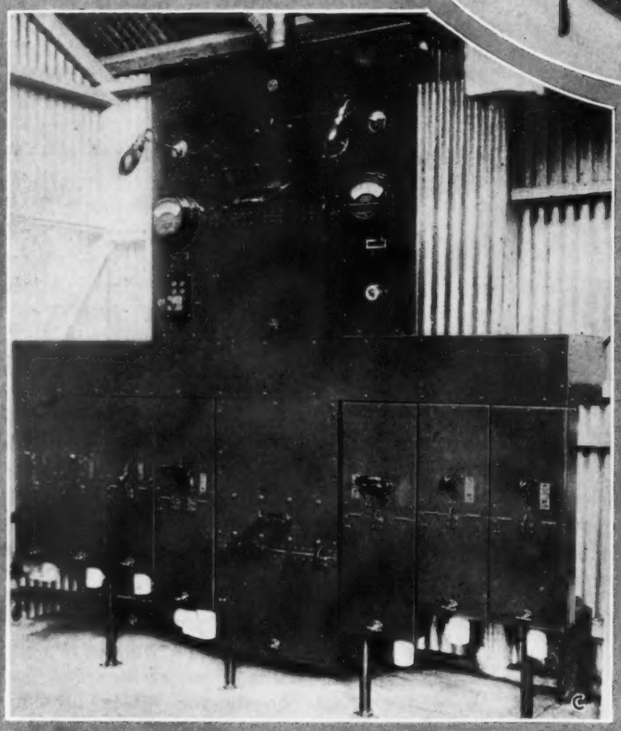
In the electric vehicle field one well-known manufacturer announces that he has nearly completed the design of an entirely new chassis for light delivery which should fill a demand for a moderate-price electric vehicle at low operating cost. Among interesting instruments which have been developed during the past year are an earth-current meter, a high-resistance fault localizer, a portable flux meter and a temperature control and recorder.

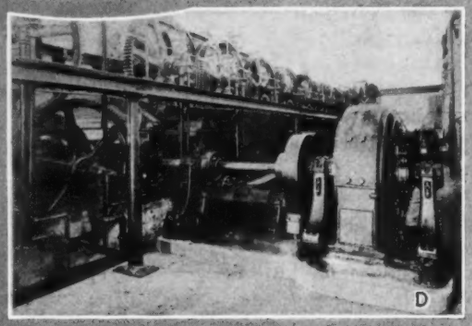
In a brief review of developments in such a large field as the electrical industry it has been possible to touch only on notable achievements. The chronicle cannot be concluded, however, without at least referring to the marked developments in radio equipment and broadcasting, long-distance amateur communication, long-distance loud-speaking telephones, carrier-current communication, cargo ship electrification and achievements in electron tubes, each of which would require a volume for adequate discussion.

Important Applications in the Industrial Field Despite Depression



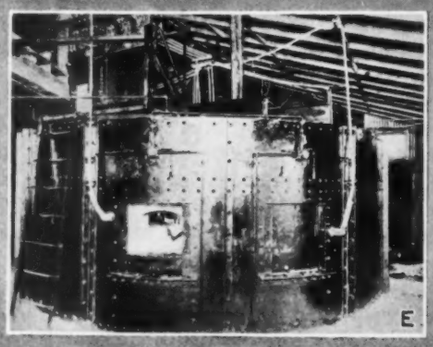






CONSIDERING the numerous applications of electricity to new or relatively untouched industrial fields, the past slump in industrial activity has not been without its compensations. Relieved of the rush of supplying equipment which prevailed during the war, manufacturers have had an opportunity to concentrate more of their attention upon developing equipment.

A few of the developments are indicated: A—Built-in direct-connected motors. B—Automatic coal-mine substation. C—Centralized dead-front industrial switchboard. D—Sectionalized drive for paper mill. E—Rotating-hearth heat-treating furnace. F—Electric shovel.



The Problems of the Manufacturer and the Jobber

The Need for a Practical Unity of Vision and a Common Purpose in the Fashioning of Plans and Policies—Good Work Really the Key to the Great Coming Opportunity

By EARL E. WHITEHORNE
Commercial Editor ELECTRICAL WORLD

IF ALL the electrical manufacturers and jobbers in the United States could be gathered together for a little while in one large room to talk, the discussion would immediately focus on what is going to happen in 1922. And out of the discussion, I believe, would come two bits of thinking—first, a wide mental picture of the conditions in the world today that are affecting this industry of ours, and second, a close-up view of the things that must be done to meet the economic situation as it is with a constructive force that can produce some measure of progress and prosperity. Such a combination of a common vision and a common purpose is, of course, most difficult to achieve among a body of scattered and competing men in any line of work, and yet just now within the electrical industry these conditions are not hard to define, and a considerable degree of unity in plan and policy should be possible.

SOME OF THE QUESTIONS

The electrical manufacturer has many problems confronting him just now and plenty to worry about. Business has been bad and plants have been running under capacity and have been put to it to find the orders to maintain production. Out of this has grown up a bad price-cutting practice that has killed the profit on much of the business that has been done in many lines, and orders have been placed on a hand-to-mouth basis that has rolled up a higher cost and harder problem of production and delivery. These are evils which the manufacturer wants to end. The tariff situation is an uncertain factor. The tax burden is a heavy load of indefinite future. The status of wages is hard to figure on with any confidence. The question of where to raise the money for continued financing is not a simple one to answer. The need for more cost data is imperative.

The electrical jobber is in a no less difficult and an even more precarious position. During the pressure of war times the economic function of the distributer's warehouse was recognized and proclaimed by the government. The jobber rendered a service of essential value, and the whole world of business heard and saw and understood. But later, in the stress of the following depression and in the keenness of the competition for orders, too many of the manufacturers have forgotten that the reason for a jobber is his warehouse and have let down the bars that are supposed to separate the men who qualify as jobbers from those who don't. And the result is a confusion in our distribution, with too many nominal jobbers and too few who with their warehouses continue to perform their economic function. But the splitting up of stocks among too many local houses and the division of the profits into too many fractions passed around have put the electrical jobber into red ink. He cannot make money the way things are. He cannot overcome the small-order trend that is putting up his cost of selling. He cannot get the earnings to enable him to play the part he wants to play in the development of markets for the appliance specialties. He is unhappy.

But behind this and beyond it all are certain fundamental facts that mean more than these things. Our troubles have been borne on the turbulent waves of abnormal times that will in turn resurge to our advantage and reverse much of the situation that we have today. For the war booms and depressions that we have been passing through have distorted the markets and their influences and upset all the natural processes of orderly evolution. An artificial stimulus caused the building of countless new factories and expanded our industrial capacity far beyond all the requirements of normal times. Then the construction of dwelling houses ceased, and following it the erection of all types of business buildings. Building waited for five years or more. Now we face a shortage of more than a million homes needed for housing the people. We have the ready capacity for the manufacture of the goods to build and outfit this big construction program. And everybody is waiting for the word to go.

The word, of course, must come not from one mouth, but from the mouths of millions, and the utterance is growing louder all the time, swelled by the increasing confidence in everybody's mind that we are working out of the economic woods. There are tangible evidences that business is slowly stiffening and gaining strength. As a natural result the householder is already beginning to buy more freely from the retailer, and the retailer will soon commence to send in larger orders to the jobber, and the jobber in turn will purchase more heavily from the manufacturer. Gradually, steadily we will see it come—more confidence, more activity, more business in a natural progression. But it will be based from start to finish on the production of goods that can flow out freely from the factory through the trade and on to the waiting people.

EFFECT ON THE INDUSTRY

All these forced conditions have had a very marked effect on the affairs of the electrical industry. With the cessation of building construction the contractor found his regular traditional wiring business slipping away from him. He looked about him for a way to live and soon saw that war times were fast building up an unprecedented demand for household labor-saving appliances. So almost every contractor has become a contractor-dealer, with much of his interest centered in store problems. But as the music of the hammer and the saw

begin to ring louder in the land and houses are seen going up in every hamlet, there will be wiring jobs in plenty clamoring for attention and the contractor will naturally respond and put more of his energy into construction. He will never cease to sell appliances, but his thought, I believe, will center once again more closely on his contracting function. And the work of appliance selling is going to be carried on more largely than ever before by the central-station company. These are trends that are not far ahead, and every manufacturer and jobber must observe and recognize and organize them into the operation of his business if he is to steer true in the tide.

There awaits the manufacturer and jobber of electrical materials a tremendous market that will absorb the utmost that they can produce and distribute, once the building and buying starts. There it lies ahead in plain sight—a million and more new houses to be built, more than five million houses to be wired where central-station lines already are available, more than seven million houses already connected that need more convenience outlets, new fixtures, more equipment, and other kinds of buildings, new and old in like proportion. All this is in the vision that all men in the electrical industry should hold in common and organize around. The market waits on the unfolding of this great program of awakening business and restored individual and industrial activity. The question is, When will it start? What can be done to hurry it along? And that is where we need the common purpose.

The building, fixing and buying program will start when the impulse of American business is put behind the people of America to make them start. We have here a condition where the individual is strong in his confidence and attention. Each man believes that business is better, that good times are almost ahead, that in a very short time it will be wise for him to spend money and do the things he has been waiting for. But in the mass this waiting bulks into inertia that blocks the path to rapid progress and slows the wave of steadily improving business. And the only thing that will remove the obstacle is the power of creative selling.

THE NEEDS WE FACE

The problem of the electrical industry today is very like the problem of all other industries. We face the need for more orders, for more money to finance a larger stock and bigger credits, in short, for a bigger operation that will produce a bigger business and a large measure of prosperity. There is only one way in which this can be done, and that is through good work. The sellers' market has passed on with the boom times and we must change our methods to conform. Goods must be sold today, and it is the manufacturer and the jobber who must grasp the vital responsibility for their resale to the consumer. The market lies in the homes and business places of the people, and the selling of the goods must carry through and make use certain.

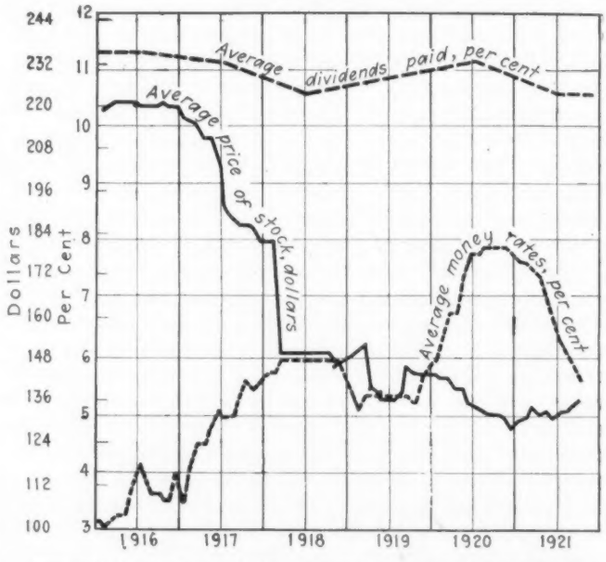
The spirit of the work must be to get the job well done, and whatever is needed to complete the operation must be provided. If more service seems to offer the way, it must be given. If more co-operation would make possible the restoration of trade, it must be made available. The goods must be sold. There is no alternative and no other purpose that can prevail.

The coming of better business to the country will bring great opportunities this year to the electrical manufacturer and jobber. Materials of every kind will be required in increasing volume as the work goes on. It will need every ounce of energy to do this job adequately, serve the market and stimulate the trade. Therefore, every bit of progress that can be made right now toward the better lubrication of our machinery of production and distribution will bring most profitable benefits. And it is worth the while of everybody in any way concerned to undertake the working out of his part in better harmony and co-ordination before the load comes on and it becomes increasingly difficult to make adjustments. So much more can be achieved without the losses caused by friction, duplication and cross purposes. So much more can be produced by more plainly balanced plans. Practical measures of standardization perfected now and sensible arrangements for co-operation worked out in detail and ready for productive use will increase the ratio of return for all this effort that will be applied by many in the coming months.

A common vision and a common purpose may be possible if it is made a simple matter of a mental focus on the work ahead. We need good policies within this industry to make the most of our great coming market, but most of all we need good work—intelligent, consistent and continuous hard work that follows through and makes the job complete. And we must find our business by creating it right where we know it ought to be. After all, this is the most important problem that the manufacturer and jobber face today.

Stability of Utility Securities Shown Graphically

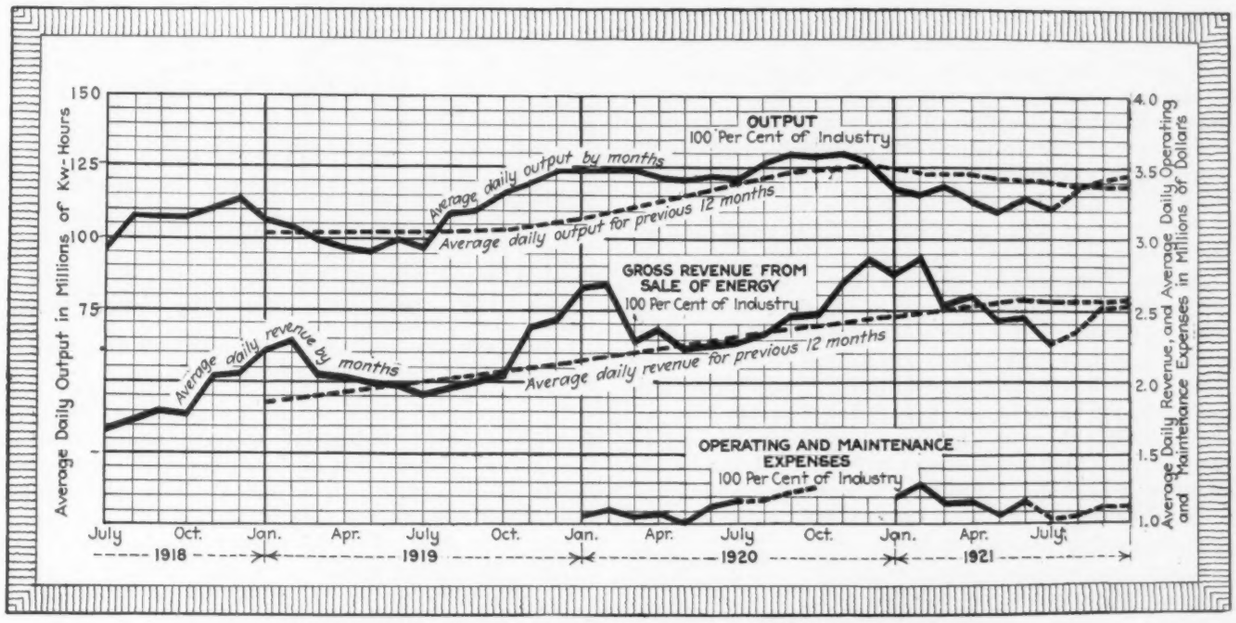
STEADY dividends even during prolonged adverse conditions have demonstrated the quality of public utilities securities. In the accompanying chart, prepared by C. D. Parker & Company, Inc., Boston, nineteen gas and electric light companies' operations were analyzed from January, 1916, to September, 1921. The chart shows that the dividends paid to stockholders during the



RELATION OF QUOTATIONS, DIVIDENDS AND MONEY RATES

above period remained remarkably steady; that the high average price of stock was $221 and the low about $129. The nineteen companies supply gas and electricity to virtually every large city in Massachusetts.

Energy Output for 1921 Estimated at 43,100,000,000 Kw.-Hr.


OUTPUT
100 Per Cent of Industry
Average daily output by months
Average daily output for previous 12 months
GROSS REVENUE FROM SALE OF ENERGY
100 Per Cent of Industry
Average daily revenue by months
Average daily revenue for previous 12 months
OPERATING AND MAINTENANCE EXPENSES
100 Per Cent of Industry
Average Daily Output in Millions of Kw.-Hours
Average Daily Revenue, and Average Daily Operating and Maintenance Expenses in Millions of Dollars
150
125
100
75
4.0
3.5
3.0
2.5
2.0
1.5
1.0
July Oct. Jan. Apr. July Oct. Jan. Apr. July Oct. Jan. Apr. July
1918 1919 1920 1921

CENTRAL-STATION OUTPUT AND GROSS REVENUE INCREASED DURING OCTOBER

FOR the year just closed the output of the electric generating and distributing companies for which revenue was received was 43,100,000,000 kw.-hr., as nearly as can be estimated from returns received by the ELECTRICAL WORLD for the first ten months of 1921. The output in 1920 was 45,678,000,000 kw.-hr., the decrease during the past year being due to the curtailed industrial energy requirements resulting from the industrial depression. New residential consumers during 1921, however, served to lessen the effect of the general slump in the electrical energy output of the country as a whole. From a financial viewpoint, the year's operations are most encouraging. Returns for the first ten months of 1921 indicate that the gross revenue was $933,950,000. This was a record and was $51,200,000 in excess of that reported in 1920. The operating and maintenance expenses are estimated at $416,922,000, as against $425,775,000 for 1920.

Perhaps the best explanation of an increased revenue during a period of decreased energy consumption is the fact that while the amount of low-revenue energy sold to industrial power customers during 1921 was materially under that of 1920, the high-revenue domestic lighting load was increased during the year by the addition of 1,001,700 new customers of this class. It appears from a recent survey made by the ELECTRICAL WORLD that the amount of energy sold for domestic lighting was increased by 13.4 per cent during 1921 by reason of new customers, and to this must be added the increased consumption of energy by the domestic customers due to the purchase of household appliances during the year. A study of operating expenses and revenue indicates that in the aggregate the ratio between these two items, often referred to as the "operating ratio," decreased during 1921 about 10 per cent below that reported in 1920. However, a survey just completed by the ELECTRICAL WORLD, an analysis of which will be published in an early issue, indicates that

TABLE I—CENTRAL-STATION RETURNS FOR TWELVE MONTHS

	Percentage of Installed Ratings Represented	Kw.-Hr. Output (Companies Reporting) 1920 Thousands	1919 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	Revenue from the Sale of Energy (Companies Reporting) 1920 Thousands	1919 Thousands	Per Cent Increase
Nov.	71	2,741,705	2,503,402	9.6	66	$54,620	$44,711	22.0
Dec.	71	2,792,554	2,648,746	5.4	66	57,697	48,580	18.6
		1921	1920			1921	1920	
Jan.	76	2,765,632	2,943,349	-6.0	70	58,855	50,861	15.8
Feb.	76	2,453,671	2,711,800	-9.4	70	55,540	48,633	14.3
Mar.	77	2,806,609	2,989,581	-6.1	72	55,513	49,071	13.3
April	78	2,675,949	2,895,067	-7.0	72	55,326	49,064	12.8
May	78	2,668,457	2,889,174	-7.6	72	53,901	47,932	12.6
June	78	2,686,479	2,872,900	-6.4	72	52,385	47,977	9.3
July	78	2,706,016	2,949,132	-8.2	72	50,747	49,195	3.4
Aug.	78*	2,839,498	3,041,927	-6.7	72*	51,931	50,848	2.1
Sept.	78†	2,844,326	2,937,500	-3.1	72†	54,427	52,955	2.9
Oct.	78‡	2,997,192	3,041,714	-1.4	73‡	57,442	55,631	3.1

	Percentage of Installed Ratings Represented	Operating and Maintenance Expenses (Companies reporting) 1921 Thousands of Dollars	1920 Thousands of Dollars	Per Cent Increase	OPERATING RATIO Steam Plants 1921	Steam Plants 1920	Hydro Plants 1921	Hydro Plants 1920	Combined Systems of Steam and Hydro 1921	Combined Systems of Steam and Hydro 1920
Jan.	40	14,562	13,085	11.3	56.1	55.3	26.8	27.0	38.1	45.6
Feb.	43	15,085	13,640	10.5	55.6	54.5	22.9	26.0	44.1	47.3
Mar.	53	18,757	17,248	8.7	56.1	57.7	23.4	19.6	40.2	44.8
April	53	17,815	16,641	7.1	53.0	56.5	23.9	19.8	41.4	43.3
May	53	17,274	16,727	3.1	55.4	56.8	24.2	22.9	40.6	44.8
June	54	18,836	19,089	-1.3	56.2	62.5	20.4	21.6	45.0	50.9
July	54	18,633	20,964	-11.1	56.8	65.9	20.6	20.2	43.0	52.6
Aug.	55	19,301	20,900	-7.6	56.2	63.8	22.3	22.2	44.5	52.3
Sept.	55	19,648	21,287	-7.7	54.1	60.3	20.8	22.1	47.3	54.7
Oct.	56	19,739	22,120	-10.8	51.6	60.8	21.3	20.9	45.6	50.8

*Includes estimates for 31 companies, representing 4.5 per cent of the total installed rating of all central stations.

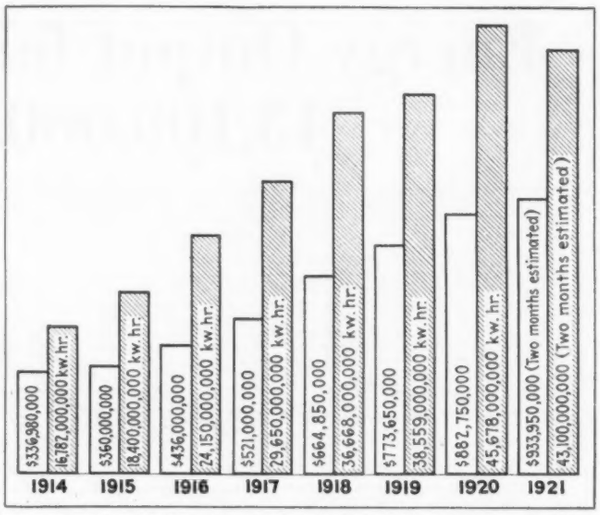
†Includes estimates for 39 companies, representing 3.7 per cent of the total installed rating of all central stations.

‡Includes estimates for 92 companies, representing 17.4 per cent of the total installed rating of all central stations.

the present operating ratio of electric generating companies having steam plants is still about 10 per cent above that of pre-war years.

Reports received by the ELECTRICAL WORLD for the month of October from central generating and distributing companies representing 78 per cent of the installed rating of the country indicates that the average daily electrical energy requirements during that month were the largest since December, 1920. A slight general increase in industrial power used and, of course, the advancing lighting requirements due to the advancing season and the cessation of daylight-saving schedules, added to the consumption of new customers, explains the increase in average daily output of 2,400,000 kw.-hr. over that reported for September.

From an economic viewpoint, the October returns are most encouraging to the electric light and power industry. The returns indicate that, while selling 1.4 per cent less electrical energy in October of this year than in October, 1920, the gross revenue from sale of energy was 3.1 per cent in excess of that received during October of last year. In addition, the operating and maintenance expenses during October were 10.8 per cent below those of October, 1920. The increased revenue may in large measure be accounted for by the fact that more than one million new residential or high-revenue energy consumers were added to the various systems during the twelve-month period. The unusual fuel shortage prevalent throughout the country during the fall of 1920, which resulted in high fuel prices, explains in large part the high operating cost reported for October of last year.



OUTPUT AND GROSS REVENUE OF CENTRAL GENERATING AND DISTRIBUTING COMPANIES 1914 TO 1921 INCLUSIVE

The output of electrical energy during October reflected increased industrial activity above that of September. Department of Labor reports indicate that eleven of the fourteen principal industrial groups showed material gain in activity during October, resulting in increased industrial energy requirements. An increase in energy consumption for lighting purposes was also reported by every section, due to the advancing season and the ending of daylight-saving schedules.

For the first time this year the number of active

TABLE II—CENTRAL-STATION RETURNS BY SECTIONS OVER A TWELVE-MONTH PERIOD

	Month	Percentage of Installed Ratings Represented	New England States			Percentage of Installed Ratings Represented	Atlantic States			Percentage of Installed Ratings Represented	North Central States			Percentage of Installed Ratings Represented	South Central States			Percentage of Installed Ratings Represented	Pacific and Mountain States		
			1920 Thousands	1919 Thousands	Per Cent Increase		1920 Thousands	1919 Thousands	Per Cent Increase		1920 Thousands	1919 Thousands	Per Cent Increase		1920 Thousands	1919 Thousands	Per Cent Increase		1920 Thousands	1919 Thousands	Per Cent Increase
KW.-HR. OUTPUT	Nov.	82	193,251	183,624	5 4	66	953,436	825,011	15 5	74	895,229	861,352	10 5	56	144,889	125,438	15 0	79	554,920	507,977	9 2
	Dec.	82	210,494	227,403	-7 4	66	969,909	917,945	5 7	74	903,628	852,264	5 9	56	140,485	133,419	5 3	79	568,038	517,715	9 6
			1921	1920			1921	1920			1921	1920			1921	1920			1921	1920	
	Jan.	81	200,269	247,800	-19.2	77	1,003,223	1,043,650	-3 9	73	860,643	956,078	-10.0	62	144,936	145,336	-0 3	81	556,561	550,685	1 1
	Feb.	81	178,694	216,890	-17.6	77	902,030	970,539	-7 0	73	789,539	882,873	-10.6	63	131,654	132,537	-0 7	81	451,754	508,961	-11.2
	Mar.	81	205,348	230,309	-10.8	79	1,029,120	1,119,428	-8 1	73	894,500	941,893	-5 0	63	139,381	136,017	2 4	81	538,260	561,934	-4 2
	April.	81	196,680	227,008	-13.3	79	963,659	1,052,716	-8 4	73	828,457	894,028	-7 3	63	132,075	135,421	-2 5	88	555,048	586,894	-5 4
	May.	82	191,141	219,298	-12.8	79	934,973	989,408	-5 5	73	819,506	899,657	-8 9	63	136,573	138,416	-1 3	89	586,264	642,495	-8 7
	June.	82	192,007	219,476	-12.5	79	940,443	1,003,727	-6 3	73	806,270	880,934	-8 5	63	136,011	129,120	5 3	89	611,128	639,637	-4 5
	July.	81	187,622	218,995	-14.3	79	934,822	1,026,390	-8 9	73	804,009	884,572	-9 1	64	140,795	141,450	-0 6	89	639,768	678,725	-5 7
	Aug.	81	205,351	224,324	-8 5	79	992,681	1,054,124	-5 8	73	848,803	923,210	-8 1	64	147,967	154,353	-4 1	89	644,696	685,916	-6 1
	Sept.	81	216,708	223,269	-2 9	79	1,005,063	1,051,495	-4 4	73	851,716	886,300	-3 9	64	149,758	151,680	-1 2	89	621,081	624,756	-0 5
	Oct.	81	243,677	221,929	9 8	79	1,160,178	1,117,590	-1 5	73	918,457	927,716	-0 9	64	154,792	160,164	-3 3	89	580,088	614,315	-5 6
REVENUE			1920	1919			1920	1919			1920	1919			1920	1919			1920	1919	
	Nov.	82	$5,898	$5,017	17 5	65	$20,938	$17,119	22 2	57	$15,158	$12,561	20 8	54	$3,853	$2,910	32 4	79	$8,775	$7,104	23 5
	Dec.	82	6,548	5,744	14 0	65	22,332	19,149	16 7	57	16,004	13,142	21 8	54	3,722	3,113	19 8	79	9,091	7,432	22 3
			1921	1920			1921	1920			1921	1920			1921	1920			1921	1920	
	Jan.	81	6,379	6,170	3 5	74	22,180	19,225	15 3	59	16,818	14,436	17 3	62	4,155	3,484	19 3	81	9,323	7,546	23 6
	Feb.	81	5,925	5,728	3 4	74	21,492	18,327	17 4	59	15,971	14,070	13 6	62	3,915	3,329	17 6	81	8,237	7,179	14 7
	Mar.	81	5,784	5,566	3 8	76	21,822	18,934	15 3	59	15,853	14,103	12 4	63	3,747	3,246	15 5	81	8,307	7,222	15 0
	April.	81	5,665	5,554	2 0	76	21,504	18,609	15 8	60	15,506	13,822	12 2	63	3,744	3,312	13 2	88	8,817	7,767	13 6
	May.	82	5,362	5,342	0 4	76	20,795	17,613	18 0	60	14,866	13,558	9 8	63	3,516	3,179	10 7	89	9,362	8,240	13 7
	June.	82	5,285	5,397	-2 4	76	20,058	17,438	15 0	60	14,485	13,519	7 1	63	3,536	3,152	12 2	89	9,021	8,439	6 9
	July.	81	5,180	5,121	1 1	76	18,798	17,155	9 2	60	14,158	14,689	-3 6	63	3,509	3,145	11 3	89	9,101	8,733	4 3
	Aug.	81	5,297	5,483	-3 3	76	19,050	17,926	6 2	60	14,465	14,594	-0 8	63	3,612	3,536	2 2	89	9,507	9,309	2 1
	Sept.	81	5,619	5,857	-4 0	76	19,992	18,749	6 6	60	15,326	15,192	-0 8	63	3,811	3,673	3 9	89	9,679	9,483	2 0
	Oct.	81	6,225	6,072	-2 5	76	21,464	20,063	6 9	60	16,130	16,134	-0 0	63	3,970	3,892	2 1	89	9,653	9,470	1 9
OPERATING EXPENSES.			1921	1920			1921	1920			1921	1920			1921	1920			1921	1920	
	Jan.	34	$1,098	$1,288	-14.7	48	$6,373	$5,411	17 8	28	$3,941	$3,451	14 2	37	$1,015	$905	12 2	54	$2,135	$2,030	5 2
	Feb.	35	1,069	1,242	-13.9	53	6,799	5,937	14 5	29	3,958	3,445	14 8	44	1,217	1,053	15 5	55	2,042	1,963	3 9
	Mar.	45	1,576	1,651	-4 5	59	7,969	7,241	10 0	35	4,570	4,228	8 2	51	1,776	1,514	17 2	79	2,866	2,614	9 7
	April.	45	1,418	1,479	-4 1	59	7,590	7,168	5 9	36	4,347	4,112	5 7	51	1,567	1,403	11 6	79	2,893	2,479	16 8
	May.	48	1,548	1,577	-1 8	56	6,921	6,660	4 0	37	4,274	4,292	-0 4	52	1,563	1,486	5 2	81	2,969	2,713	9 5
	June.	46	1,737	1,862	-6 7	56	6,916	6,878	-0 5	39	4,843	5,152	-5 9	60	1,835	1,678	9 4	83	3,565	3,519	1 3
	July.	47	1,712	2,077	-17.6	53	6,772	7,111	-4 8	39	4,940	5,800	-14.8	62	1,870	2,039	-8 2	83	3,339	3,937	-15.1
	Aug.	48	1,861	2,088	-10.8	53	6,871	7,131	-3 6	39	5,028	5,793	-13.2	62	1,892	2,003	-5 5	88	3,648	3,884	-6 0
	Sept.	49	1,950	2,213	-11.8	54	6,837	7,280	-6 0	40	5,354	5,680	-5 7	63	1,949	2,184	-10.7	88	3,558	4,030	-11.7
	Oct.	48	2,043	2,033	0 5	57	7,144	7,790	-8 3	39	5,012	6,069	-17.4	63	1,974	2,299	-14.1	88	3,566	3,929	-10.2

TABLE III—AGGREGATE OPERATING RATIO OF COMPANIES REPORTING DATA MONTHLY TO THE "ELECTRICAL WORLD"

Type of Generating Plant and Month	New England States				Atlantic States				North Central States				South Central States				Mountain and Pacific States			
			Average for Year				Average for Year				Average for Year				Average for Year				Average for Year	
	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920
Steam Plants:																				
January	54.0	60.8	54.0	60.8	53.5	50.9	53.5	50.9	61.2	61.8	61.2	61.8	53.1	53.7	53.1	53.7	69.0	60.5	69.0	60.5
February	54.3	59.5	54.2	60.3	52.3	53.0	52.7	52.1	63.0	57.9	62.1	59.8	59.1	51.2	56.2	52.3	60.2	60.3	64.3	60.3
March	64.0	70.0	56.7	62.5	54.5	56.7	53.3	53.7	58.4	59.7	60.8	59.8	53.3	50.9	55.0	51.9	68.4	62.5	65.9	61.2
April	59.4	63.5	57.3	62.7	50.9	54.3	52.8	53.8	54.8	61.2	59.3	60.2	54.1	52.8	54.7	52.1	53.7	53.7	61.8	58.6
May	63.2	69.1	58.3	63.8	56.2	58.6	53.4	54.5	54.7	63.3	58.5	60.8	53.3	56.0	54.4	53.0	55.0	57.0	59.9	58.3
June	60.1	71.2	58.7	64.9	55.8	59.5	53.8	55.3	56.6	68.3	58.3	61.8	55.3	60.0	54.6	53.8	53.4	56.2	58.6	57.8
July	60.7	77.3	59.0	66.7	57.2	62.7	54.1	56.1	56.9	70.6	58.1	63.0	55.1	62.4	54.7	55.3	53.3	59.3	57.8	58.0
August	67.3	72.3	60.1	67.3	55.8	61.3	54.2	56.6	56.0	70.0	57.8	63.9	53.3	57.3	54.3	55.7	51.8	59.8	57.0	58.3
September	57.7	71.2	59.8	68.1	52.7	59.4	54.1	56.8	56.9	60.3	57.8	63.6	52.9	60.3	54.2	56.1	46.2	55.7	55.8	57.9
October	57.5	68.5	59.6	67.9	51.3	60.9	53.8	57.3	57.1	63.5	57.0	63.4	51.8	59.2	54.0	56.4	47.8	57.5	54.7	58.0
Hydro Plants:																				
January	26.5	35.2	26.5	35.2	21.2	21.2	21.2	21.2	25.0	20.8	25.0	20.8	26.4	20.1	26.4	20.1	27.5	27.3	27.5	27.3
February	30.1	46.5	26.8	35.6	20.1	20.6	20.7	20.9	24.1	20.6	24.6	20.6	28.6	21.4	27.4	20.5	23.9	27.9	26.0	27.6
March	29.9	30.0	26.9	35.3	21.0	20.6	20.8	20.8	23.0	20.6	23.5	20.6	30.4	23.2	28.4	21.3	24.9	19.0	25.8	25.6
April	24.6	34.7	26.5	35.2	18.2	18.8	20.2	20.3	24.8	20.8	24.2	20.7	22.4	25.0	26.8	21.2	27.3	19.2	26.0	24.2
May	26.5	25.6	26.5	34.3	15.5	17.4	19.2	19.7	21.5	20.1	22.5	20.5	27.9	21.2	27.1	21.2	29.8	22.9	26.6	24.0
June	29.2	21.5	26.6	33.8	17.6	18.8	19.0	19.6	21.1	19.5	22.8	20.2	27.3	18.3	27.1	20.7	30.3	27.4	27.6	24.2
July	29.2	29.6	26.6	33.9	15.9	21.1	18.6	19.8	19.4	19.7	22.3	20.2	27.3	18.3	27.7	20.7	24.2	19.9	26.3	23.7
August	31.4	36.5	26.8	33.9	16.7	20.9	18.3	19.8	20.7	21.6	22.0	20.4	33.7	23.1	28.5	21.0	25.1	24.3	26.2	23.6
September	31.4	32.2	26.8	33.4	16.0	19.9	18.1	19.9	20.8	21.1	21.9	28.7	27.6	20.2	28.4	20.9	23.4	22.8	25.9	23.6
October	32.0	32.0	26.8	33.4	17.8	22.9	18.1	20.2	20.3	18.1	21.6	20.2	30.0	21.0	28.4	20.9	26.4	23.6	25.9	23.6
Combined Systems of Steam and Hydro Plants:																				
January	45.3	53.5	45.3	53.5	43.5	45.8	43.5	45.8	39.5	38.6	39.5	38.6	38.6	46.6	38.6	46.6	35.2	45.6	35.2	45.5
February	44.3	60.0	44.7	58.8	41.8	41.9	42.6	43.8	42.4	49.8	41.9	48.2	41.7	39.6	40.5	42.0	39.6	43.8	37.4	44.7
March	49.7	53.8	47.3	56.0	39.7	47.3	42.0	45.3	41.5	46.0	41.8	47.3	38.6	39.2	40.2	41.2	36.4	39.7	36.9	43.0
April	46.6	48.5	47.1	53.5	42.9	43.9	41.9	44.8	45.0	48.3	42.7	47.5	43.6	48.6	40.7	42.8	37.0	36.8	37.0	41.0
May	49.2	48.5	47.6	52.3	39.8	44.2	41.4	44.7	47.0	52.8	43.7	48.8	40.7	39.6	40.6	42.2	35.0	38.3	36.4	40.3
June	58.5	56.5	49.6	53.2	42.3	45.8	41.6	44.9	50.1	62.2	45.0	51.6	45.1	44.8	41.3	42.7	38.8	44.3	37.0	41.1
July	56.1	63.2	50.5	54.7	42.6	51.3	41.7	45.8	51.6	64.4	46.0	53.9	53.6	45.3	41.4	42.8	35.4	43.1	36.8	41.5
August	60.6	62.7	51.9	55.8	46.5	49.0	42.3	46.2	51.2	64.5	46.6	55.5	45.3	50.0	41.9	43.8	36.8	43.5	36.7	41.8
September	62.9	65.5	53.4	57.3	47.4	50.6	42.9	46.7	51.2	62.6	46.9	56.3	45.0	47.3	42.2	44.2	38.3	47.7	36.9	42.5
October	59.3	67.9	54.2	57.4	47.5	47.8	43.4	46.8	47.3	60.5	47.3	56.9	46.3	52.5	42.7	45.3	37.4	42.7	37.0	42.5

spindles in New England textile mills during October exceeded these reported as active during the corresponding period in 1920. The other primary industries of this section were operating at about the same capacity as during September. These slight increases in industrial requirements, augmented by an increased lighting load and new lighting and industrial customers, resulted in an average daily electrical output of 790,000 kw.-hr. in excess of that reported for September.

Steel and iron activity continued to show slow improvement during October, but most other industries in the Middle Atlantic States were operating on a par with September. Increased activity in the South Atlantic States was especially noticeable in the textile industry, almost half a million more spindles being active than during October, 1920. The unusual drought in this section was not broken until the last few days of the month. This condition resulted in largely reduced production of energy by hydro-electric plants and the continued operation of all available steam auxiliary plants. Some industrial plants were forced to curtail operations owing to inability of the power companies to supply adequate service.

Daily Output Higher in Atlantic States

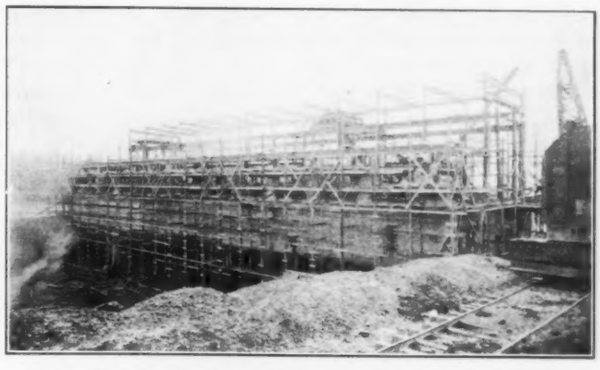
Taking the Atlantic section as a whole, the increase in industrial requirements in conjunction with the increased consumption of electrical energy for lighting and new domestic and industrial customers resulted in an average daily electrical output of 2,600,000 kw.-hr. in excess of that reported from this section during the month of September.

Increased activity was reported by virtually all the principal industries of the North Central States during October, resulting in an increased energy consumption which, combined with the seasonal increase in energy requirements and new customers, was sufficient to raise the average daily energy output of this section by about 1,700,000 kw.-hr.

A large decrease in the irrigation load, while mining and manufacturing operations were about on a par with those of September, resulted in large curtailment in industrial energy requirements in the Mountain and Pacific States during October. As a result of these adverse conditions, and notwithstanding a substantial increase in lighting requirements and new customers, this section reported an average daily output of about 2,200,000 kw.-hr. below that of September.

First Development Under Federal Water-Power Act

THE new 8,000-kva. hydro-electric power plant for Henry Ford & Son on the Hudson River at Green Island, Troy, N. Y., built by Stone & Webster, is pictured below. This is the first development authorized



VIEW SHOWING OPENING FROM FOREBAY TO WATERWHEELS

by the Federal Water Power Commission. It will utilize water from an existing government dam built in 1915 and will furnish power required in the manufacture of parts for automobiles and tractors. The approximate cost of the power plant will be $1,750,000.

Utility Management and Finance

THE REAWAKENING of business will bring to the central-station company some interesting problems. Questions of rate reduction, wage adjustments, the quickening rural market, the selling of securities and the spending of the money all will call for new thought and bring with them new opportunity.

Utility Outlook Brightest in Industry's History

BY GEORGE N. TIDD
Vice-president and General Manager
American Gas & Electric Company, New York

CONSIDERING the general conditions of the public utilities, the year 1922 should see a marked increase in new construction. As many needed improvements have been postponed, the installation of additional equipment will extend throughout the entire system from generating station to distribution lines.

As I look at it, the whole utility situation is very largely a question of banking. At the present time the only drawback to the expansion of the electric light and power companies is the amount of money that can be raised on satisfactory terms. For the past few years the utilities have been confronted with a compounding of high prices for material and equipment and high-priced investment money which they could not stand. While this has retarded the building of new plants and installation of equipment, it has in a measure been a blessing in disguise. Industrial companies are seriously affected by the overhead charges on new plants constructed at a high cost for material with money at a high rate of interest. The utilities which could not then afford to make other than absolutely imperative extensions are now finding themselves in a very comfortable position.

With investment money getting cheaper, the electric light and power companies are able to go ahead with the work of increasing their generating and transmission capacities, which has of necessity been postponed. There are few companies that have an appreciable amount of unsold capacity and many have been unable to supply service to any large new consumers because of power shortage. These companies' plans call for the installation of additional equipment against the resumption of industrial activity, which is very likely to materialize sooner than has been expected and would result in another serious power shortage.

With many companies the power business has just about held its own in spite of the fact that the use of power by some large consumers has fallen off. The increase in commercial and residential load has been tremendous. The result of this condition has been to allow a breathing spell for new construction, and at the same time what business has been lost in low-priced power has been made up in lighting load earning a higher rate per kilowatt-hour.

To my mind, the utilities can profitably spend for new construction all the money they can obtain at a reasonable price, with the assurance that there will be a ready market for the added capacity as rapidly as available.

Viewed from every angle, the electric light and power utilities are right now in a better position than ever before in their history because of several outstanding factors in their favor:

First—They have got in closer touch with the public and have gained the confidence and assistance of their customers. Through the sale of stock locally and the open policy of the companies in laying their cards face up on the table people have come to understand the utility problem.

Second—With adequate rates which are equitable for both the consumer and the company, the utilities for the first time have a chance to set up reserves for depreciation and contingencies. These rates will not be taken away because public utility commissions realize and appreciate the fact that it is to the public's interest for the utilities to prosper.

Third—There is an almost unlimited market for electric power and the day of the small plant is past. Many large consumers are able to buy power for one-half of what it would cost them to make it themselves. There is no question that central-station power is the more economical, and at rates which will return a profit to the company.

Fourth—Most companies have their present equipment in good condition and are ready to go ahead with the installation of more equipment. This can now be done at a comparatively favorable cost for both money and material.

Making the Purpose of Security Sales Clear to the Public

BY JOHN F. GILCHRIST
Vice-president Commonwealth Edison Company

THE ease with which new capital is being obtained by those companies which are selling securities to their customers is resulting in some changes in view on the part of managements which tend to hinder the greatest accomplishment. For instance, when plans for these sales were first made, in times that were the hardest possible from the standpoint of raising money by former means, most liberal terms of payment were offered to those who desired to pay on such a basis, and other similar inducements were made. Since it has been found that a large percentage of the money has been paid in cash, and that many of the people approached who wished to make monthly payments have not made a particular point of a greatly extended period, the inclination has been to shorten up terms very decidedly and rather to ignore an important portion of the field.

While it is true that a great deal of money can be obtained on the shorter terms—and this has its desirable features from the standpoint of the treasury—it

is a great mistake to lose sight of the fact that the most this abridged plan is accomplishing is the placing of already accumulated investment funds, and that it is doing very little to educate the people in the communities to the idea of putting away in such investments a very small amount every month over an extended period. Companies should, therefore, be urged so to plan their sales as to cover the largest number of possible subscribers, to sell as much as possible for cash, to sell what they can on a slightly less favorable basis with ten or twelve months to pay, and in addition, to attempt also to sell to people who think they have nothing to invest but who might be encouraged to come in on a twenty-four-month or even a forty-eight-month basis.

It may be desirable, at least until it is fairly tried out, to put some limitations around any plan contemplating an extension over a long period, but this can be accomplished in many ways. For instance, it would undoubtedly be practicable to offer to customers the opportunity to subscribe in the names of their minor children between the ages of twelve and twenty-one years, not more than one share to a subscriber, payable as an item of $2 added to the monthly electric bill.

Advantages of Deferred Payments

There are many advantages in such a plan. In the first place, children take great pride in such personal property. They would be educated in the matter of buying securities, educated in the matter of saving a regular amount monthly, and, above all, their attention would be turned toward the advantages of public utility securities as an investment.

The managers of companies entering this work are urged to set forth clearly at the beginning all that they wish to accomplish by these plans and then not to let any ephemeral success prevent their getting, in all respects and at all times, the most they can out of them.

In this connection attention is called to the necessity of being most careful to see that only the safest securities are offered for sale to customers. Nothing should ever be sold on which, under any conditions ordinarily conceivable, the periodical income could be suspended. If in this movement any great amount of securities are placed in the hands of small investors which in time of stress will not pay dividends, the injury to the whole field of utility investments will be incalculable.

Another matter to which the utilities should give immediate attention is that of developing a broad secondary market for utility securities. The volume of such securities in the hands of the public is tremendous, and unless the opportunity is provided of selling utility stocks when occasion demands on at least as broad a market as any other securities, utility securities will suffer. There is altogether too great a tendency on the part of even the most far-sighted financiers to assume that all of these securities are being bought for absolutely permanent investment and, when putting out stock in a given issue at a reasonable price, to allow the market to take care of itself. To such an extent is this carried that there is frequently a difference of ten or fifteen points between the price at which the stock is being offered to the public and the price which a holder of the same stock must take when for some reason it is necessary to realize upon it.

These are only a few of the many questions which should be considered most carefully by those responsible for the financing of public utilities and for maintaining the integrity of the securities of the industry.

Process of Deflation Brings a Rate Problem

By W. W. Freeman
President Union Gas & Electric Company, Cincinnati, Ohio

ALONG with the general economic deflation and the continued gradual reduction in the cost of living there will probably develop before this year is done a rate problem. The people of all cities are watching with keen interest the little recurring evidences that the prices of commodities are slowly scaling down. And the public is going to expect reductions in utility rates, for the simple reason that without knowledge of facts men will naturally assume that the electric light and power company should do as other manufacturers are doing and readjust its prices to the changing conditions. They will think this if they are left to reason without facts, but if they have the facts and understand the position of the utility clearly, they will not ask for anything that is unreasonable or unfair.

It is of the utmost importance that the utility go before the public early, in advance of any general popular attention and opinion on this subject, and tell the story. Truth will prevail, and the thing to do is to tell the truth—the whole truth—fully, frankly and in detail. It is a matter of record, though it was almost unknown and has been entirely forgotten by the public, that the central-station companies did no profiteering during the war. The public utilities carried on until higher expense caused by the war had eaten up all profits and begun to jeopardize their actual existence, and then by recourse to the utility commissions they sought relief directly from the people that they might be able to continue serving not only the industries but the homes as well. The result was that the cost of electric service increased something like 17 per cent, which was out of all proportion with the increase in central-station operating costs and the higher costs of other commodities and service that go to make up every family's cost of living.

Lay the Case Before the People

Therefore it is right, reasonable and appropriate at this time that the executive of a utility should lay before the entire public the case of that considerable proportion of the people who today are owners of the utility, either by direct purchase of stock or by deposit or investment in bonds or in insurance companies whose funds have been applied in the financing of public service enterprises. These tens of thousands of direct or indirect investors, through the directors and officials who administer these utilities, made a great sacrifice during the war by delaying all appeals for rate increase until the last possible moment and not attempting in any way to join in the popular wave of profiteering. It is only right, therefore, that the small increases which in time they were compelled to secure should not be taken from them until the loss can be in some part repaid through the coming years of reduced expenses.

This is the story that must be told if the people are to understand the situation and appreciate the motives of the utilities in their belief that their rates cannot be reduced to the pre-war scale while costs are still above pre-war expenses and the grievous losses which have been suffered have not yet been made up. And the people will be interested in such a presentation of the case. But the people, I believe, will be interested even more in the other side of our story, which is the

message of electric service and its greater value in the home today. Let us also tell the public of the worth of our service at present rates and they will be perfectly satisfied with its costs. In Cincinnati today I believe it would be possible to sell $10,000,000 worth of electrical equipment without connecting another building to our lines. Here is our opportunity, and if we will place ourselves clearly and frankly in the confidence of the people in the coming rate situation and then go forward and do good work in the selling of this idea and ideal of complete electric service in each home, we shall have nothing to fear.

How to Balance the Reduced Industrial Demand

BY T. I. JONES
General Sales Agent Brooklyn (N. Y.) Edison Company

AS A RESULT of the bad times which happily are now passing there has been a falling off in industrial load in almost every city. The demands of war built up an industrial capacity above normal. Boom times kept factories running past the war, then the reaction came, and throughout the country work fell off and the demand for power dwindled. Now conditions are improving slowly but steadily. The fact remains, however, that there is a hole to be filled by the central-station sales department. The question is: What can be done right now to offset the decreased industrial load and build up the curve where slow times in the factory have affected it?

In Brooklyn we have more than 200,000 customers connected, of whom over 150,000 are residence customers. It is clear, therefore, that the residence predominates as a source of business. Moreover, though they are smaller as units of purchasing power than industrial customers, they are more stable. For people live on through good times and bad. They light their houses, they heat them, they eat, and they enjoy every comfort that they can. And so they cling to the continued use of all the applications of electric service that they are accustomed to, because they save labor, and saving labor, save time and expense. In consequence the residence appliance load offers the central station small units of day-load business that in the aggregate can bulk large and employ a considerable capacity that is idle when the industrial demand falls.

We have, therefore, been making a determined effort to sell appliances to our residence customers and to insure the wiring of as many homes as possible. Because of other needs for capital we have interested many of our local contractors in financing house wiring for themselves so that the jobs can be done now, while the business is needed, and the householder may pay conveniently in deferred payments. The result of this consistent drive to build up more residence load has been most productive. Whereas industrial business and commercial business together have been increasing, month by month, this year less than 10 per cent, our residence load has been steadily climbing in excess of 40 per cent over corresponding months of last year. And this business is fundamental. It is permanent. It is distributed among our predominant class of customers. It will not be subject to business conditions. It is a service which will be used by the people in their ordinary course of living.

Industrial conditions through the country are improving. The railroads are beginning to place orders in a way that clearly indicates a returning confidence. The automobile industry is showing a reaction to somewhat better times. Both these industries are good barometers, and the central-station company can undoubtedly expect to see a gradual improvement in its industrial business. It will not be rapid enough, however, to justify no further thought of ways and means to fill up the hole. Other business must be sought that can be obtained more quickly on the wave of the general expectation of better times and connected to the lines to make immediate demand. It cannot come from commercial customers, because commercial customers are affected in like measure by the general business situation and will come back to vigor with the factories. It is to the residence that we must turn for the quick and permanent and stable business that is needed.

We must sell appliances and we must sell them in a bigger volume than we have been accustomed in the past either to plan or expect. We must work with a broader vision and a greater courage to analyze these homes we serve, calculate what appliances they can properly use, and then go put them on the lines by the power of our selling. On such a quantitative basis there is a market here worth any company's attention—and the quality is also most satisfying.

The Central Station Wage Problem

BY SAMUEL FERGUSON
Vice-president Hartford (Conn.) Electric Light Company

AT THE beginning of this new year it is but natural that the subject of wage reductions should be in the mind of the executive of the central-station company. There is in process a general deflation of commodity prices, and costs are being watched with care. Employee compensation is, of course, an element in utility cost that has a definite bearing on the cost of living. It is well, therefore, that inquiry should be made into this situation. But one does not get far into this question without realizing that sweeping generalizations upon it are entirely unwarranted.

A fair determination of whether employee compensation should be readjusted requires a study of wages paid to individuals performing different classes of service throughout a period of years, plus an analysis of the relation between such wages and the cost of living. During the war period wages and living costs changed greatly, and although both curves ascended, or rather both sets of curves rose, the angles of advance and of subsequent decline did not remain parallel, either for groups of employees or for individuals. In some cases wages advanced too fast and to unwarranted levels; in others living costs increased proportionately beyond the wages established. The real test is the purchasing power of the wages, and an equitable determination must take account of this as applied to the individual or to the class employee who is representative of his team mates in the central-station organization.

In an address before the Chamber of Commerce of the United States in Atlantic City on April 27, 1921, Magnus W. Alexander, managing director National Industrial Conference Board, New York, discussed "Living Costs and Wage Adjustments" from the angle of the purchasing power of the compensation paid to workers. The application of the methods of analysis de-

scribed by Mr. Alexander in this paper to the study of wages within the central-station industry will show managers of such utilities whether wages should be decreased, increased or allowed to continue unchanged for particular classes of employees or for individuals.

The ratio between the money wage and the cost of living gives the "real" wage received by the employee or group at a particular time, and by plotting these on a time basis the tendency can be shown at a glance for each case studied. At a given date, for instance, the money wage may be represented by the index-number 300, compared with the 1914 wage as 100. The cost of living is represented at that time by an index number of 250, let us say, compared with the 1914 base of 100. The ratio of the two, or 1:2, is a "real" wage index and shows that at the time plotted the "real" wage or actual purchasing power of the worker is 20 per cent above the 1914 level. At a later date (for purposes of illustration) the "money" wage index drops to 180 and the cost of living index to 120. The ratio becomes 1.5, meaning that the purchasing power of the worker on this second date is 50 per cent above the pre-war base. Now, if such an analysis shows that the employee has been gaining at an unreasonably rapid rate upon the cost of living, the predisposition is in favor of a downward adjustment of pay; if, as in some cases an analysis of this kind is almost certain to disclose, his purchasing power has not risen materially above the pre-war base, a readjustment of wages may not be warranted. Should any employee's purchasing-power curve fall below the 100 per cent or pre-war base and not be offset during the period studied by advances on the plus side of the line, the presumption would be that an increase in compensation is in order.

Reasonable employees will see the fairness of this method of analysis if it is worked out for a period of several years during which their wage (and salary) history is plotted in terms of purchasing power or "real" wages.

The Prospect of Business from the Farm

By G. C. Neff
General Superintendent Wisconsin River Power Company

A REMARKABLE change has taken place during the past year in the viewpoint of central-station-company operators regarding the demand of the farmers for electric service. Where rural service was formerly viewed as a fad due to the war prosperity of the farmer, the demand is now being more clearly recognized as the result of increased economic pressure on the farmer to find ways and means of reducing his production costs. Besides, it affords greater comforts on the farm and gives to the farm home the little things that make the city home so attractive. Gradually the farmer has acquired the sanitary and water-supply conveniences of the city through the development of the apparatus that will bring these things into the farmhouse on a basis that the farmer can afford. The demand of the farmer for the conveniences of electric service is a natural sequence to the other improvements. Along with obtaining the service he has discovered that there are ways and means of utilizing it to cut down the cost of conducting his operations. It is not an uncommon experience to find that electric service makes possible saving the salary and living expense of one man or several, and in many cases a reduction in the cost of keeping horses or in the number of horses required. Operations that have hitherto taken the strength of two or more men have been made possible, through the use of power, with only one man, and sometimes with only the casual attention of one man who is engaged in other tasks at the same time.

Issue Must Be Faced

In effect, the problem of the public utility is to find means for bringing the farm to the city so far as electrical service is concerned. This involves an increase in the rates that have prevailed in city service. This increase is determined by the cost of the lines that are necessary to reach the farm and the fixed and operating charges thereon. There is no need for hesitation on the part of the utility management in asking for the increased rates necessary, since a little careful study will reveal advantages and saving of expense that will clearly justify the cost from the farmer's viewpoint. The problem should be faced as a purely business matter and the individual problem carefully analyzed to bring out all the factors. For the time being there will be many cases in which the distance from sources of supply will be such that the service will not be worth its cost. A careful analysis will enable public utilities to show that this is the case, and frank and honest showing of the facts will be a protection that will be invaluable when the development and practices become reasonably well stabilized.

The time has passed when electric service companies can dodge the issue. It will be far better to face it frankly now than to be forced to face it later with some one unfamiliar with the operation of utilities in a position to force a plan of service that may not be wise. Wisely handled, the situation is in the hands of the central-station industry to direct in a manner that will be of benefit to the industry and of infinitely greater benefit to the consumers. The latter can be protected from the mistakes which are certain to occur if they are forced, through the lack of interest on the part of the central-station companies, to develop their own means for obtaining service. Development of rural service along the lines that rural telephone systems have followed in many states would be a menace that no electric light and power company can afford to incur.

Another factor of extreme importance is the education of the farmer in the use of electric service. No problems are presented on the farm essentially different from those that exist in the city home. The farm itself presents much the same problem that the factory presented to the central-station commercial engineer and the equipment manufacturer fifteen to twenty years ago. Then the factory equipment was designed to fit the abilities of the older forms of power-providing equipment. Since then the whole electrical industry has applied itself to producing equipment that would fit the abilities of the newer source of power supply, so that now the older forms of equipment look extremely crude. The same process of development must be employed with farm equipment, though fortunately the solution of the factory problems has taught a lesson that will shorten the process and eliminate many of the mistakes that would otherwise be inevitable. But the central-station company must interest itself and play a part in the solution of the problem of developing farm equipment because it is one of the most important points of contact between the farmer and electric service.

Engineering Advances Few but Spectacular

THE accomplishments in radio communication have been epoch-making. Unprecedented transmission voltages have been adopted. Marked steps have been taken to assure still further reliability of electric service, and economies of electric operation are becoming recognized as never before.

Economy of Electricity Recognized in Steel Plants

BY R. B. GERHARDT
Superintendent Electric Department,
Bethlehem Steel Corporation

RESTRICTED operations in the steel industry during the past year have seemed to emphasize the important part that electricity plays in effecting economies that are vital toward reducing the cost of manufacture of steel products. The replacing of steam engines by electric reversing-motor equipments on the first finishing stand of the Lackawanna rail mill, on the 44-in. blooming mill of the Bethlehem Steel Company at its Steelton plant, and on the 25-in. blooming mill of the Atlantic Steel Company are definite examples of economies so effected. During the year American manufacturers have built more than thirty-eight electric motors for the larger main-roll drives in steel mills, about eight of which have been shipped to foreign countries. This represents an approximate total of 49,270 hp., ranging in size from 6,300 hp. down to 300 hp. in a single unit.

A problem of great interest now confronting the steel-mill electrical engineer is that of the increasing tendency toward the adoption of 60 cycles as a standard frequency. Most of the large central-station companies of this country have standardized on this frequency, while a greater part of the steel plants are operating at 25 cycles, and to adapt these plants for the use of central-station power or connection to a superpower system will necessitate using large frequency changers. The Tennessee Coal, Iron & Railroad Company has on order a 7,000-kva. frequency changer for this purpose which will be about the largest unit of its kind in steel-mill service. It is doubtful whether the steel mills will consider changing existing equipment from 25 cycles to 60 cycles until this equipment becomes obsolete, but on any extensions of a broad nature the higher frequency may be used advantageously.

OBJECTION TO 60 CYCLES FOR MAIN-ROLL DRIVES

The principal objection to the higher frequency for mill work lies in the fact that for large low-speed motors such as those used on main-roll drives the 60-cycle machine is so large that the cost is considerably out of line and there is also a considerable sacrifice in power factor. To overcome these objections higher-speed motors are suggested, using reduction gearing between motor and mill. However, this adds another piece of apparatus to the drive, which some of the steel men consider a complication. This prejudice may require some time to remove.

On the operation of electrically driven reversing mills a development of considerable importance has been the rearranging and grouping of control, making it possible to handle the mill with two instead of three and four operators in the mill pulpit, at the same time maintaining the same accuracy of control as before without any decrease in production.

The gas engine as a prime mover for producing power in the steel industry continues to occupy a prominent position, as is evidenced by the fact that the Illinois Steel Company is just completing the installation of an additional gas-electric power plant at South Chicago. An achievement worthy of note during the past year was the successful operation of a gas-engine-driven power plant from a single blast furnace by making use of a moderate-sized gas holder with certain automatic regulating features for maintaining an uninterrupted supply of gas to the engines during the casting periods on the furnace. For a plant operating under these conditions as much as 260,000 kw.-hr. has been developed with the gas from one 500-ton blast furnace in twenty-four hours.

AUTOMATIC SUBSTATIONS COMING TO THE FRONT

The automatic and remotely controlled substation is coming to the front in steel-mill work as well as in railway and other lines, and it is expected that future installations will be quite numerous with the growth of the industry. A matter under investigation in this country which has been exploited with some success abroad is the use of large mercury-arc rectifiers in place of rotating machinery for converting alternating to direct current. This piece of apparatus should be especially adapted to this type of substation.

The progress of electrification in the steel mill has been so successful with regard to application in the mills proper that a broader field is now under investigation taking into consideration the electrification of the plant railroad yards, with the idea of eliminating steam locomotives for transportation. Whether or not this will work out best with third-rail operation or by the use of storage-battery locomotives is yet to be determined; in either case considerable economy is possible.

In the electric furnace field an event of considerable importance was the starting of the two 40-ton, three-phase Heroult furnaces at the Government armor plant at Charleston, W. Va. On Feb. 2 last the first heats were tapped. A very high grade of steel has been produced and the whole equipment has functioned very successfully. The induction furnace is being exploited further in this country, and a practical demonstration has been carried on at the Pittsfield works of the General Electric Company, where a 4,000-lb. furnace has been in successful operation for some time past melting down silicon steel scrap on a basic lining. The life of this lining has proved to be very satisfactory.

Improvements in control apparatus now make it pos-

sible for the steel mill to obtain magnetic controllers beyond the dreams of the electrical troubleman of several years ago. The life of contacts, arc chutes and wearing parts has been appreciably lengthened, wiring has been considerably simplified, and features have been incorporated making use of improved ideas.

The advent of the new year marks no little progress in the following out of the electrical safety code in the steel plant. It is now a very rare thing to find an uncovered switch or unprotected piece of electrical apparatus. Safety organizations are maintained, and safe practices are being taught unceasingly.

The outlook for the new year from a development standpoint looks good, particularly since an improvement in business conditions is predicted, and there are many steel mills awaiting this improvement to go ahead with electrification.

Last Year One of Achievement in Radio Communication

BY DAVID SARNOFF
General Manager Radio Corporation of America

RADIO development during 1921 may be chronicled as a series of commercial achievements. The practical application of the wireless-telephone transmitter as a means of "voice broadcasting" to the home and fireside of news items, music, lectures and so forth is an outstanding development of the year and one which has untold possibilities.

Already there are a half dozen broadcasting stations in the United States in daily operation, working on definite schedules, with programs which are outlined and published in advance. The development of the radio telephone and the activities of the Westinghouse Electric & Manufacturing Company in opening broadcasting stations stimulated and developed interest along these lines. Offhand, there are at present about 100,000 receiving stations in the United States.

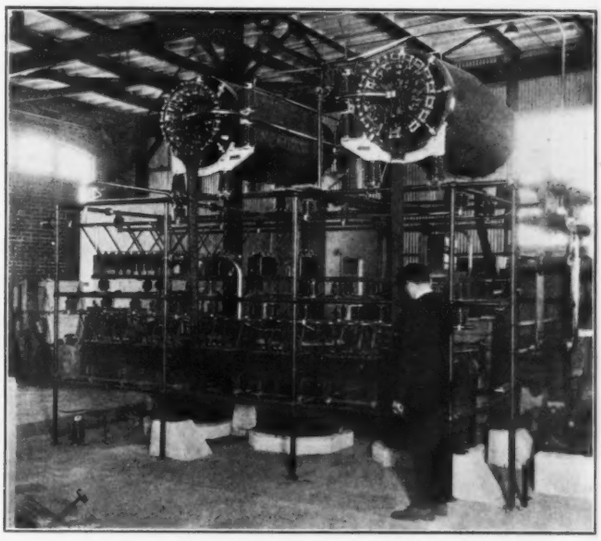
The period is at hand when the broadcasting receiving set will have the appearance of the phonograph, and the receiving antenna may be even placed within the cabinet. The time is not far distant when broadcasting stations will operate at several wave lengths, one of which will be devoted to lectures, another to operatic selections, another to news items, and so on. This will mean that the particular form of entertainment most pleasing to the recipient will be available without any interference with the program being carried out on other wave lengths.

The past year has demonstrated beyond cavil the commercial utility of the radio-frequency alternator. There are more than a dozen of these alternators, developed and built by the General Electric Company, installed in American stations giving outputs of 200 kilowatts each. Not only do these machines give signals at the far-distant receiving stations that are more readily decipherable than those obtainable from a spark station, but also they radiate "purer" or "sharper" waves, which tend to reduce to a minimum interference between a number of stations in simultaneous operation.

Equally important has been the further development and practical application of the multiple-tuned antenna, which has considerably increased the radiating efficiency of high-power radio stations.

Most marked improvements have been made in long-distance radio reception. Incoming radio signals are now automatically transferred from the receiving stations over land-line wires direct to a central operating office where they are automatically recorded on paper tape by specially developed ink recorders and transcribed on message blanks by operators. This eliminates the human relay at the receiving station and obviously results in a marked saving in the time of delivery and a decrease of errors. During the past year a method has been devised whereby two or more radio signals may be transferred to a central operating office simultaneously over a single land wire.

A method has now been devised whereby the signals sent out from four different European radio transmitting stations can be intercepted in the United States on one receiving antenna without mutual interference. This has enabled receiving operations to be centralized at one point with the resulting obvious advantages. Before another year has passed it is likely that all the European radio signals intended for reception in the United States may be received simultaneously at one centrally located receiving point.



MAGNETIC AMPLIFIER AND TRANSFORMER RACK AT NEW LONG ISLAND RADIO STATION

One unit of what will ultimately be the world's largest and most powerful radio station has been put in operation during the past year at Rocky Point, L. L. This station eventually will have from six to ten transmitting units capable of dispatching radiograms to all parts of the world. On the occasion of the recent official opening a radiogram broadcast to the world was recorded in virtually every country, the message, for example, having been copied directly in Australia, New Zealand and Japan. This station will be remotely controlled from a central office in New York City.

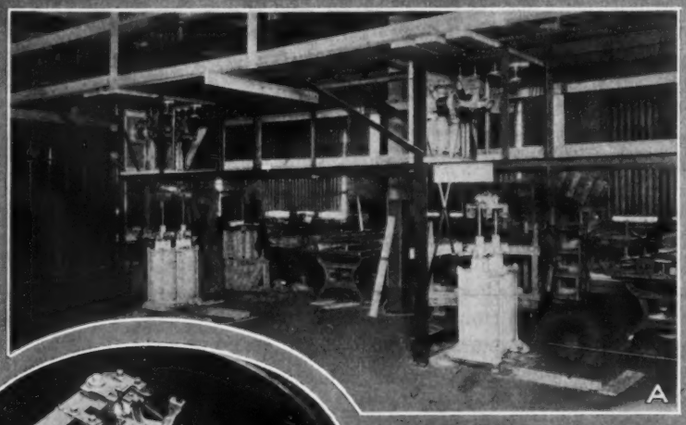
The United States is not only well represented in the world's long-distance commercial radio network but it has actually established itself in the foremost ranks by its providing powerful transmitting and receiving stations in Massachusetts, Long Island, New Jersey, California and Hawaii.

Tests made during the year 1921 have proved quite conclusively that a continuous-wave vacuum-tube transmitter will provide from three to four times the transmitting range by radio telegraphy obtainable from the quenched-spark transmitter.

For the past year or more the American Telephone

Greater Reliability and Economy Mark Tendencies

A FEW ways in which this has been achieved include the isolation of phases (A), means for securely grounding transmission lines (B), manhole circuit breakers for isolating faults (C), centralization of boiler room control (D), provision of transmission loops with radial feeders (E).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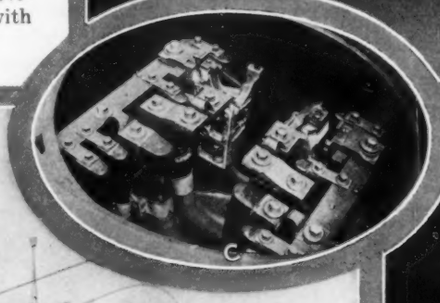
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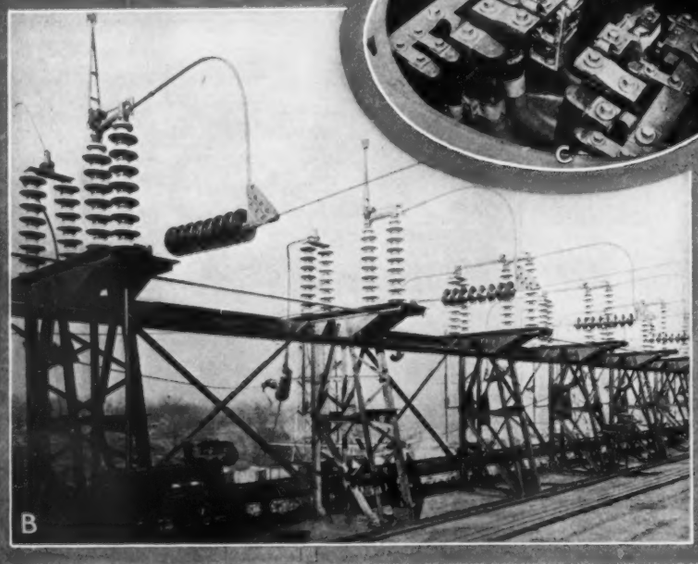
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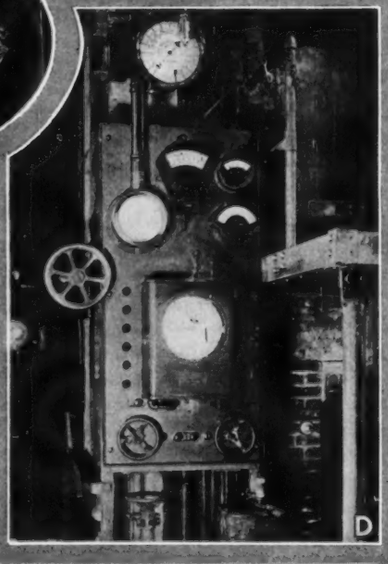
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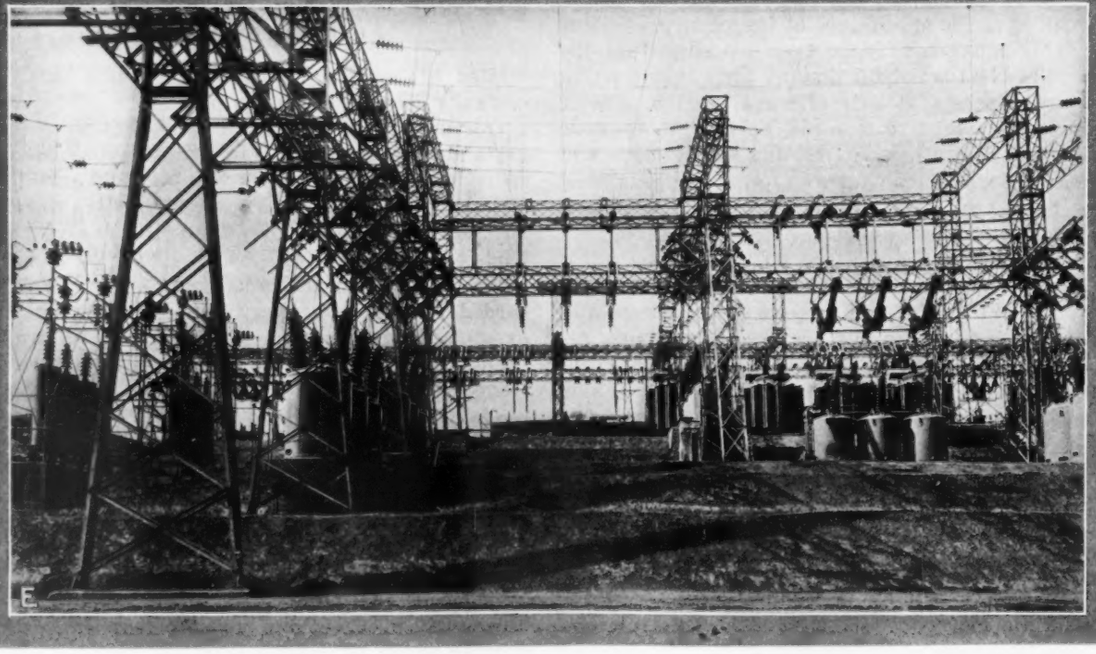
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& Telegraph Company has had in operation at Deal Beach, N. J., and Green River, Mass., radio-telephone transmitting and receiving stations which were connected up with the land-line network of the Bell telephone system. With such nation-wide land-line facilities as this system possesses, a passenger on a vessel plying the Atlantic coast may hold conversation with his home or office direct from the vessel, the circuit from the ship to the shore station being via the radio method and from the shore station to the final receiver by land line. These experimental sets have been duplexed so that two-way conversation is possible.

There have been developed during the past year a group of medium-power continuous-wave vacuum-tube transmitters designed specifically for the overland radio communication, and already several of these stations are being operated in Central and South America. Tests of a 2-kw. tube transmitter made during the past two months have already disclosed that such a set provides the transmitting range of a 15-kw. to 20-kw. rotary or quenched-spark transmitter. It will soon be possible to duplex these sets.

Higher Voltage Transmission in the West

BY S. BARFOED
Electrical Engineer, with Frank B. Baum, Consulting Engineer, San Francisco

THE progress which was made in the West during the last year, particularly by the Great Western Power Company, the Southern California Edison Company and the Pacific Gas & Electric Company of California, toward voltages higher than any thus far attempted indicates that the next step to 220,000 volts or thereabouts may be taken with the greatest confidence.

In the past year the Great Western Power Company finished the construction of its Caribou station on the Feather River, which has its line constructed for operation at 165,000 volts ultimately. One circuit has been built and insulated for the full voltage, and this line is the first to be equipped with static shields for the reduction of the voltage duty of the line and units of the insulator strings. In this case the shields consist of metallic disks with rounded edges supported between the conductors and the insulators. Laboratory tests indicate that these shields will be quite effective in reducing the likelihood of flashovers of the insulator strings, although operating experience has been meager.

Opinions seem to be united upon the point that lines to be operated at 220,000 volts will require the use of some form or other of static shields, but the exact form that these should take and their placing with reference to the insulators is a moot point. Extensive laboratory tests would indicate that the exact form of the shields is not a matter of great concern provided that certain rather wide limits are observed. These limits, of course, vary in different cases, depending upon the type of insulator and number of insulators per string and upon the conformation of the line and insulators with respect to the tower members. In each case, however, the aim has been to reduce the unit duty on the line-end unit in order to protect against flashovers, and in the event that such occur to direct the arc away from the insulator string. Another thing to be met is the varying conditions which are introduced when rain starts to fall and the insulators start to dry out.

An interesting test is now being conducted by the Southern California Edison Company upon one of its Big Creek lines, which were designed for and now operate at 150,000 volts. A portion of one of these lines has been insulated for 220,000 volts and provided with shield rings connected to the line conductor and placed so as to surround the second insulator from the line wire. The line is energized from one end only, and from the result of this test the belief is expressed by the Southern California Edison Company that the matter of reinsulating the entire line for conversion to 220,000 volts will be a comparatively easy matter, and that this can be done without the use of insulator units of greater diameter than that of those at present in use.

FLASHOVERS DO NOT CAUSE EXPECTED DAMAGE

The decision of the Pacific Gas & Electric Company with respect to the insulation of its Pit River lines, which are to be operated ultimately at 220,000 volts, has not been announced, although it has been intimated that a more radical change will be shown than in the case of the Southern California Edison Company. The exact date upon which these lines will be placed in operation at 220,000 volts has not been determined, and such a decision is involved with a determination of the control devices, line-end units and other such details.

The real problem in the operation of high-voltage lines is the flashovers, which occur without warning and without explainable cause. Various reasons have been advanced to explain the cause of these flashovers, but thus far none seem to hold true for all cases which have been noted. That these flashovers do not cause any material damage or long interrupt service is a characteristic of such lines and of the generators which supply power to them. These generators are usually constructed with a rather low ratio of short-circuit current to full-load current, and with adequate protection in the way of relays and switches the other portions of the transmission system to which the lines are connected are not seriously influenced by these disturbances. In most cases the lines are immediately returned to service without the need of changing any insulators, and that such may always be the case is the aim of many of the experiments to determine the form of shield to use. If the flashovers cannot be prevented, then it is hoped to reduce their importance and to suppress the spread of the disturbance.

LARGE CONDENSERS FOR LINE REGULATION

The principles of the use of synchronous condensers to line regulation are meeting with a steady expansion in application. Last year a condenser rated at 30,000 kva. was installed at the receiving end of the Big Creek line. Future lines are being designed to operate at constant voltage and with almost flat regulation from end to end. With sufficiently large condensers at points 100 miles apart along the line, it is calculated that such a line would be at practically uniform voltage throughout and that the voltage could be regulated independently of the load or the power factor.

In this connection it should be noted that not only the transformers at the generating-station end and also at the receiving-station end are being considered a part of the transmission line, but also that the synchronous condensers at intermediate points and at the end of the line are being considered as a part of the line itself and designed to operate accordingly.

On the lines of higher voltage no lightning arresters are being provided, reliance being placed on added insulation in the winding of the transformer. As disturb-

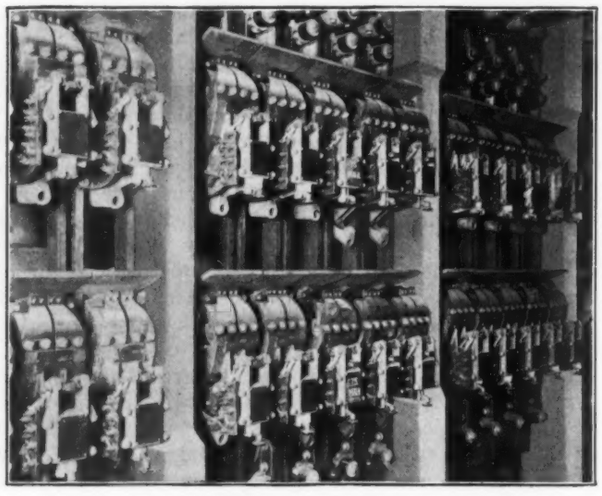
ances of the frequency of lightning strokes cannot travel along a transmission line for any great distance, it is felt that the inclusion of lightning arresters at the generating stations and substations is a complication which is not fully warranted.

Throughout the entire West the growth of the individual transmission systems has been such as to make for a close approach to the superpower system idea.

Still Greater Reliability the Aim in Station Design

BY B. G. JAMIESON
Commonwealth Edison Company, Chicago

CENTRAL-STATION companies that have been placed in service during the past year, though not so numerous as might have been anticipated, involve some electrical features not altogether new, but of special importance because their inclusion practically



REMOTE CONTROL DIRECT-CURRENT BUS SELECTORS DEVELOPED BY NEW YORK EDISON COMPANY

amounts to standardization. The evident purpose in these improvements is increased reliability. For example, consider the 1921 plant complement of current-limiting reactors and oil breakers of interrupting rating approximately 1,000,000 arc kva. in comparison with earlier stations with breakers of low duty and minus the current-limiting reactors.

Within generators fire-extinguishing systems have become virtually a standard accessory. While the extinguishing medium has, perhaps, not been finally standardized, a conducting system consisting of circumferential piping spraying either water, steam or gas directly on the armature coils has been generally adopted. For generator cooling the merit of the inclosed ventilating air-supply system combined with the spray form of washer has also been commonly recognized. Possibly a surface-condenser cooling system will be a development of the near future. The exploration of armature temperatures was considerably extended during the year.

While the shaft-end exciter still holds its place as a standard, investigations have been made to further minimize their susceptibility to system disturbances. In some cases batteries have been found necessary as supplemental sources of exciting energy; in other cases, and for different reasons, separate motor-generator outfits have been used. There has also been some development of automatic throw-over devices to batteries or other unfailing sources of excitation. Of remote origin and yet intimately related to the field strength and stability of generators is the phenomenon of low-system power factor. This has received marked attention during the year past on the part of central-station companies.

The motorizing of auxiliaries has been further extended. Except where thermal efficiency is directly involved, 2,300-volt motors are practically standard for uses of 100 hp. and over. Where the economizer is employed auxiliary motor loads of 6,000 hp. per 100,000 kw. are not uncommon. A great deal remains to be accomplished before actual standardization of excitation and auxiliary drive methods is attained, although 1921 has seen the beginning of some effective organization toward this end. A marked effect on existing practice would result from a definitely established policy toward the house turbine and a study of the power factor and speed adjustment of alternating-current motors.

For the protection of major electrical apparatus differential or balanced relays have become almost universal in their application. During the year there have been made available for use with terminal apparatus balanced-current relays without interconnecting pilot wires, which have the requisite sensitivity and the advantage of greater simplicity. The protective relay equipment of outgoing lines has not undergone development of a radical nature, the general tendency being toward differentiation between earth and interphase short-circuits in order to gain greater selectivity.

In the grounding of system neutrals there is a tendency toward the use of higher resistances. More consideration is also being given to the use of reactors for this purpose. With some relays recommended or actually installed during the past year the higher resistance employed aids in the selective functioning of the outgoing line relays. One company has made provisions for voltage regulators in outgoing feeders.

Quite extensive use has been made of the ironclad truck-type switch for auxiliary service in several large plants. These units are similar to those used for customers' service from primary systems.

Partial outdoor installations of transformers and switching equipment have been made in connection with some stations supplying a portion of their output at high voltage, full outdoor installations being the rule for those high-voltage plants having no local distribution at moderate voltage. For outdoor installations rain-proof-type reactors are being considered.

The most radical departure in switch-house design, as exemplified by two larger plants, is the segregation of phases. This innovation, combined with dependable reactors placed ahead of all points of convergence of phases, eliminates the possibility of interphase short-circuits on the buses. This arrangement permits central stations to be operated without sectionalizing, thus making possible all benefits of parallel operation. In one station the automatic control of the disconnecting switches and remote grounding by the use of the same agencies, all placed at one point removed from proximity to the switches or bus, reduce hazards to life and minimize the effects of man failure. Special attention has also been given to the ventilation of switch houses so that gases or smoke may be quickly removed. In one plant the whole structure is convertible to an outdoor installation with a very slight change.

Central-Station Commercial Plans

CONFIDENCE and optimism are strong among the light and power companies, and in spite of all the discouraging influence of past months of business depression, plans are being formed for broad, creative sales activities this year along many lines, backed by a genuine enthusiasm.

Appliance Selling Will Be Intensified and Increased in 1922

CENTRAL-STATION companies throughout the country are planning for increased activity in merchandise sales this year. There is a strong feeling of confidence in the expanding opportunity to sell appliances and the need for a constructive development of the residence load.

The Fort Worth Power & Light Company says:

We are planning to increase our salesroom space by more than 100 per cent, which will enable us to display a great many large pieces of merchandise which have heretofore been handled at a disadvantage on account of not being properly displayed. As the necessity arises we will, of course, increase our sales force.

The Columbus (Ohio) Railway, Power & Light Company says:

Our appliance business has been greatly stimulated during the past three months owing to the enlargement of our store and to greater effort being put forth to make sales. We have not curtailed our commercial activities during the business slump, but on the contrary have increased our efforts and plan to continue throughout the coming year.

The United Electric Light & Power Company of New York City says:

We propose increasing our selling activities in distributing merchandise. Our idea is to bring the electrical shops to the people in the shape of wagons loaded with miscellaneous material supported by a crew leader who will call upon all the customers of the company presenting the many useful devices we have for sale. This campaign will start immediately after Jan. 1 and will be carried on by two crews that will operate in the various districts in the borough of Manhattan covered by our mains. During the year 1922 a combination sale of two appliances every month at a reduced price, with easy time payments, will be continued.

In Spokane the Washington Water Power Company has just participated in a co-operative electric show which has been put on jointly by the central-station company, manufacturers, jobbers, contractors and dealers. It has proved a great success, and the company plans to increase its sales force in order to do more active door-to-door appliance selling and build up the appliance business.

The Rochester (N. Y.) Gas and Electric Corporation is steadily increasing its electric merchandising operations. It says:

We have provided a larger showroom in connection with our office and are gradually increasing the line of electric merchandise which we carry. Our merchandising operations are conducted with profit, and our prices conform with those of other electrical dealers in the city.

The Cleveland (Ohio) Electric Illuminating Company does no merchandising, but is doing an exceedingly active work in promoting demonstrations, publicity and sales for all local electrical dealers. Its plans for 1922 embrace a "home electric" exhibit, a model electric factory demonstration and a consistent effort to increase appliance sales in every direction. The company is confident of large success.

The current of opinion as expressed in a large number of letters on this point all flows strong in the same direction, and the situation is well pictured in this word from the Public Service Electric Company, Newark, N. J.:

From present indications we would estimate that next year sales will be made in proportion to the degree of hard work and intensive effort made to secure them. This seems to be borne out by our own experience and that of others whom we have observed. During this past year it has been necessary to work hard to make sales, and results have been in proportion to the effort put forth. If intensive efforts are made next year, we believe good results will be obtained.

In just this same way we shall intensify every phase of our sales work next year. Our newspaper advertising will be published every day or three or four times a week instead of once a week. In other words, we shall make every effort to overcome the present buying inertia of the public and we believe that this increased effort will produce a greater volume of sales next year than we have secured this year.

One Middle Western manager declares to this effect:

In general it is my firm opinion that now is the time for central-station companies to exert themselves to the utmost in the line of sales activity. This is probably true of every business at the present time, and I believe it is a mistake for electric light and power companies not to appreciate that they should fall into line, and forget the war-time policy which led most of them to give up their sales departments. Instead of assuming that the sales department idea was a wrong policy, I believe that we should go into the matter harder than we ever have done.

The Prospects for More Power Considered Very Promising

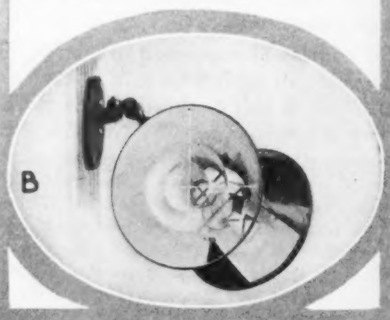
DESPITE the very large industrial capacity that was built up in factories erected for war production, there is a general expectation of a sizable increase in power business this year. The load has fallen off, of course, in almost all sections of the country during this period of depression, but more men are now being taken on in many industries, and there is good prospect that the capacity now idle will be put to work as business quickens this year and goods are flowing more freely out of the works. With this larger activity, central station companies are looking for more motor installations and increased power sales. The Chattanooga (Tenn.) Railway & Light Company writes:

The outlook for more power business, both in increased loads at plants we are now serving, the changing over to electric drive of plants now operated by steam and the electrification of new plants which we hope will be under construction early in the year, leads us to believe that our power prospects for the coming year are most excellent.

In Boston no spectacular development of power busi-

A Few Developments in Lighting

A—Wrigley Building, Chicago, floodlighted. B—Nest of parabolic reflectors for Albany - Schenectady highway lighting. C—Bare gas-filled lamps in Rochester. D—Blue - glass gas - filled sign lamps.



ness is in sight, but a steady progress is anticipated in the way of taking on new loads, especially among establishments whose equipment is rapidly approaching the wearing-out or obsolescent stage. The demonstration of the value of central-station service during the war has resulted in this territory in general acknowledgment of the folly of building new private generating plants for industrial and mercantile power service.

The Columbus, Delaware & Marion (Ohio) Electric Company says:

The power business of this company shows an increase each month over the same month last year, notwithstanding the industrial depression, October having been 14 per cent better than October, 1920. We have quite a number of "prospects" for additional power.

The Baton Rouge (La.) Electric Company writes:

Prospects for power business are very encouraging. We have received a number of inquiries from prospective customers who are contemplating the establishment of industries which will create a demand for more or less power. So we are contemplating the installation of an additional unit of 1,500 kw. capacity at our power plant during 1922, as our load is rapidly nearing the capacity of our present equipment.

From Los Angeles this message comes from the Southern California Edison Company:

As business conditions become more normal there is every indication of a steady increase in the demand for power service. Many new industries are being started in California and many Eastern manufacturers are considering the installation of branches on the Pacific Coast. This means that the manufacturing and industrial load will be considerably added to during the coming year. In the agricultural line many more acres are being brought under cultivation, and where electrical energy is available, electric power is used for operating pumping plants for irrigation. Development and operation of oil properties is also creating an increased demand for power, and we believe in 1922 this demand will be still greatly enlarged.

The Cleveland Electric Illuminating Company writes:

We believe that new power business is going to come very slowly. However, some of our more important industries are improving, and during the past ninety days some business has developed from entirely new industries which are starting up. These have all been small, but the fact remains that there has been some new business while six months ago there was none. One of the interurban roads operating east from Cleveland has changed over and is now buying power from us for its entire requirements. The tendency, we believe, is going to be for all of the smaller lighting companies to buy power from some large producing center, where that is possible, and shut down their inefficient generating stations.

But in New York, according to the United Electric & Power Company, they are looking forward to a steady increase in power business during the coming year and believe that the rate of increase of business will materially improve. They have a number of propositions under high-tension contracts which they expect to close during 1922.

And again in Rochester the Rochester Gas & Electric Corporation is extremely confident. The company says:

The outlook for more power business is very favorable. We have taken on as much new power business in the form of connected load this year as we did in 1920. For a number of years we have maintained a highly efficient sales and service organization, made up of trained college men whose duties are to secure additional power business and give expert engineering service to those power customers already on our books. We have carefully maintained this organization through good and bad times, and the general public has come to have a great deal of confidence in the company through the personnel of this organization. The result has been that we have had a continuous and very satisfactory growth in our power business.

In short, there is no lack of work for the power sales department nor of opportunity for the development of industrial business among the factories of every city, no matter how retarded their production has been of recent months. It is the general belief that better power business is close ahead.

Planning House-Wiring Campaigns in Many Cities

THE expectation of increased building activity throughout the country is gaining steadily, and central-station companies are planning to support the electrical contractor stoutly in promoting more complete installations of electric wiring. But the wiring opportunity will not be limited to new construction, for the coming of better business is expected to bring with it a very large volume of extension and repair work in houses already wired and the wiring of many old houses now located along the lines or within reach of profitable extensions. Campaigns are being organized already in many cities to take up the work as the season opens.

Says the United Electric Company, Springfield, Mass.:

Next spring for a period of two months we expect to conduct another old-house-wiring campaign. By this plan the contractors do the wiring and we pay them cash when the work is completed, taking over a lease from the electrical contractor signed by the house owner, the terms of which give the house owner ten months in which to pay. We used this plan during the spring of 1920 and in 1921 and secured considerable business which we believe we would not have had otherwise, and up to the present time we have not lost a cent from uncollectible accounts.

The Citizen's Electric Company of Battle Creek, Mich., writes:

We look for an extensive campaign in house wiring of both new and old dwellings early in the year if tentative plans for exploiting "electricity in the home" do not run amuck. The contractor-dealers have invited the Consumers' Power Company and ourselves to co-operate in a campaign of collective advertising, urging the convenience outlet and its attendant appliances.

The United Electric Light & Power Company of New York City says:

We are planning a campaign on all unwired houses in our territory. We have prepared a list of every house that can be reached without the extension of our mains and propose to send to the inmates each month pieces of literature which will point out the advantages of electrical service. The progress previously made indicates good business along this line for the coming year.

We purpose also to organize a campaign for more outlets. This applies to already-wired premises where more outlets could be conveniently installed. If our combined effort in a campaign on advertising and solicitation can be organized, I sincerely believe surprising results can be accomplished as more branches of the industry are involved than in any other campaign that I can think of, and if we will go still further and get the manufacturer, contractor, jobber and appliance manufacturer interested in this movement, we can more rapidly accomplish our object than by a single effort of any one organization.

A great many companies have written that their plans are not yet definite, but that they wait only upon the actual evidence that building is really under way to organize for a wiring drive. With the coming of spring everywhere the work of old-house equipment, according to these indications, will be taken up with more energy than has been general for a good many years.

The Year in Association Activities

TECHNICAL, manufacturing and commercial bodies show, alike in their independent and their interrelated proceedings, the steady progress of the science, the art and the industry. All societies ready to take advantage of the prosperous times ahead.

A. I. E. E. Pushes Standardization and Changes Scheme of Meetings

FOUNDED in 1884 for "the advancement of the theory and practice of electrical engineering and of the allied arts and sciences," the American Institute of Electrical Engineers is both the pioneer among American national electrical organizations and the one in which the professional as distinct from the industrial or the commercial side of electrical development is preeminently represented. It has always ranked in dignity, learning and achievement with the leading engineering associations of the world, and an unbroken record of progress has marked its career. In 1921 the membership of the Institute increased from about 12,200 to more than 13,500, or over 10 per cent. Three new sections were organized, known as the Lehigh Valley, the Connecticut and the Omaha Sections, and five new student branches were established, making the total number of sections and branches 107. During the year an important change in the policy of holding meetings was made by the directors, all regular monthly meetings being made section meetings, and general meetings of the Institute being limited to four each year, including the midwinter, the annual and the Pacific Coast conventions.

Last year the revisions in the constitution adopted in 1920 became effective, resulting in the election of one vice-president from each of the ten geographical districts into which the United States and Canada have for this purpose been divided. The standing and technical committees of the Institute, through which the greater portion of the important work is accomplished, have regained and in most instances surpassed their pre-war activity. The standards committee completed another revision of the "Standards of the A. I. E. E.," and the new edition was published in April. The marine committee brought its work to the point where publication of the progress made was deemed desirable, and accordingly in January last the Institute published "Recommended Practice for Electrical Installations on Shipboard." Outside of its own organization limits, the Institute, as one of the constituent bodies of the American Engineering Standards Committee, took a prominent part in the preparation of electrical standards, and it consented to act as distributing agent for the revised report, published in October, of the American Committee on Electrolysis. In this connection it is interesting to note that, in harmony with its policy of close co-operation with other organizations on matters of material interest, the Institute is now represented on the governing boards or committees of fifteen bodies in which electrical engineers have an interest.

The expense connected with printing most of the Institute's important papers twice—once in the monthly *Journal* and again in the annual *Transactions*—has brought about the adoption of a plan whereby, beginning in 1922, the papers and discussions constituting the *Transactions* will be published monthly as a part of the *Journal*, these papers being bound together at the end of the year for members who desire them in this collected form.

N. E. L. A. Makes Great Progress in Reorganization Plans

AS ITS name indicates, the National Electric Light Association, the greatest in size of all the bodies that draw their members from the electrical industry, dates back to the days when lighting was almost the sole concern of that industry. Founded in 1885, one year later than the A. I. E. E., the association has grown steadily to its present vast proportions, when the companies which send engineering and commercial representatives to its crowded conventions generate approximately 95 per cent of the public utility electrical output of the nation. Included in the organization of the association are four national sections—namely, Accounting, Commercial, Public Relations and Technical—and each of these sections embraces a number of bureaus and committees. In addition there are a number of important national committees.

Within the last eighteen months the reorganization of the N. E. L. A., as proposed and authorized at its Pasadena convention, has been effected, at least in so far as the major elements are concerned. This reorganization included the creation of a staff at headquarters which administers systematically to the multitudinous activities of the association. The organization of this staff embraces a number of departments, each headed by a specialist. Of the thirteen geographic divisions authorized by the Pasadena convention twelve have been formed.

A movement looking toward the revival of commercial activities in the electrical field and having behind it all branches of the electrical industry was launched at a meeting of the executive committee on Dec. 15. The movement will be carried on under the direction of the Commercial National Section and the lamp committee of the N. E. L. A., co-operating with other associations and organizations as well as individuals interested.

Federal taxation, limitation of tax-exempt securities, water-power legislation rules and regulations, customer ownership, rural-line extensions and inductive interference, and many other questions of great importance to the electrical industry of the country, were taken up in a national way by officers and committees of the N. E. L. A. during the first six months of the current

administrative year, which began July 1, 1921. Great progress was made with many of these subjects.

With the adoption by the Federal Power Commission of a set of rules and regulations to govern the issuance of licenses and to regulate the licensees, the water-power development committee of the association, working with a sub-committee from the Accounting Section, undertook to have certain of the rules and restrictions modified. The decision of the Federal Power Commission is expected to be made early in 1922.

The financing of new water-power projects, as well as the adequate financing of existing properties in order to enable them to expand to meet the demand for service, was a subject of continuing study by committees. In furtherance of proper financing a customer ownership committee was organized and is undertaking the compilation of facts regarding customer-ownership plans and campaigns of companies which already have undertaken this form of financing. Additional millions of dollars are expected to become available for investment in electric light and power securities as the result of activities of a new joint committee of the N. E. L. A. and the National Conference of Mutual Savings Banks.

A committee on rural-line extensions was appointed and divided into sub-committees which are making special studies of all questions relating to such lines.

One of the larger national activities has been the carrying on of a study of the causes of inductive interference. In this connection there has been developed a joint committee of the American Telephone & Telegraph Company and the N. E. L. A. which is endeavoring to formulate a national co-operative policy. This work, begun more than a year ago, is being carried on aggressively during the present administration.

Closely affiliated with all of the different activities is the national program of good-will advertising and publicity, which was continued vigorously throughout the last administrative year.

Despite Inactivity in Steel Industry A. I. and S. E. E. Reports Advances

WITH a membership composed of individuals actively engaged in or identified with the application of electricity to the iron and steel or allied industries, and firms engaged in the manufacture of iron and steel, the Association of Iron and Steel Electrical Engineers was founded in 1906 for "the advancement of the application of electricity to the iron and steel or allied industries by the co-operation of its members." It now has sections in Philadelphia, Chicago, Pittsburgh, Cleveland and Birmingham, and its growth is indicated by the fact that five hundred engineers attended the 1921 convention at Chicago last September.

Owing to the prevalence of inactivity in the steel industry during the year, much of the work outlined by the electric furnace committee, involving as it did continuity of operation, could not be completed. For the same reason the electrical development committee had little to report, although the advent of a steel-mill controller with contacts and arc chutes lasting from fifteen to twenty times longer than former designs was announced. The educational committee presented a "Crane Operators' Manual." The standardization committee presented specifications for electric overhead traveling cranes, and its sub-committee on motors reported that the general specifications on alternating-current motors for main-roll drives had been revised and would not require further change until new developments had taken place in the art. Working plans were formulated by the sub-committee on illumination.

Illuminating Engineering Society Reports New Types of Street Lighting

"ADVANCEMENT of the theory and practice of illuminating engineering and the dissemination of knowledge relating thereto," the constitutional object of the Illuminating Engineering Society, has been steadily followed during the fifteen years of the society's existence. Although lighting by gas and other mediums necessarily enters into the society's scheme of operations, electrical illumination by the very nature of the case provides its paramount field of work.

The work undertaken by the society during 1921 is indicated pretty clearly in the reports made to the Rochester convention last fall by five committees. The committee on lighting legislation presented a revised code, formal approval of which from the American Engineering Standards Committee is expected. The committee on nomenclature and standards reported the definitions adopted by the meeting of the International Commission on Illumination held at Paris in July. It also directed the attention of the research committee of the society to the desirability of investigating color values in terms of black-body color temperature and arriving at standards of integral color suitable for adoption, and also to the absence of suitable data on which to base definitions of glare. In the report of the committee on progress improvement in searchlamps was reported and two new types of street lighting were described. The standardization of lighting-fixture accessories was hailed as a forward step.

An outstanding feature of the Rochester convention was the announcement of a new light source called the neon-tungsten arc-incandescent lamp, which consists of two slightly separated helical tungsten electrodes inclosed by a bulb containing neon gas.

Institute of Radio Engineers Promotes Standardization

IN MAY, 1912, the Institute of Radio Engineers was formally established with a membership less than fifty. Today it numbers about 1,800. The objects of the institute, as stated in its constitution, are "the advancement of the theory and practice of radio engineering and of the allied arts and sciences and the maintenance of a high professional standing among its members." Its most important committee is the committee on standardization. This committee, composed of twenty of the foremost radio engineers in the country, was at work during the past year revising the definitions of radio terms in use since the beginning of the art and framing definitions of terms which have come into use during the past few years, when the advent of vacuum-tube devices introduced a long list of new terms. The international character of radio communication has made it advisable to co-operate in the standardization of terms with foreign technical bodies and with representatives of the communication departments of foreign governments. It is expected that a "Book of Standards" will be published by the Institute early in 1922.

Society for Electrical Development Forges Ahead

IN THE nine years of its existence the Society for Electrical Development, Inc., on whose board of directors central-station companies, manufacturers, jobbers and contractors have each equal representation with directors-at-large, has persistently worked up further the objects set forth in its constitution, the first of which is "to promote and increase the use by the public of electric current for all useful purposes as an end in itself and as a means for increasing the demand for apparatus and supplies, and to promote and facilitate a co-operative planning and execution of various means and methods effective to this end."

In 1921, which saw the selection of that nationally known champion of co-operation, William L. Goodwin, to have executive charge as assistant to the president, a few of the society's many accomplishments were:

Fifty-five articles pertaining to the electrical industry were accepted and published by leading non-electrical magazines. These articles, which dealt with very many features of electric service, had an aggregate circulation of nearly a million. The *Monthly Sales Service* was improved and a number of new features were added.

About 600 requests a month were received for the booklets compiled and published by the society. Old booklets were revised and plans for new ones made. Two publications concerning the society itself were distributed. Five hundred and seventy newspapers received the society's "Weekly News Service."

An investigation into many fires attributed to electricity showed the prevalent looseness of practice in this regard, and due publicity was given to all of the facts.

Field activities of the society increased, and in four months representatives from headquarters attended fifty meetings of electrical men in various parts of the United States and Canada.

Special service to members and to local leagues was rendered, and efforts at standardized and still more effective service were made. Close co-operation with the National Association of Electrical Contractors and Dealers was achieved.

A campaign for increased membership, to be carried on by the present members, was started and received a gratifying response. Local membership "drives" were also started.

The annual Christmas campaign, in which non-members were allowed to participate, showed an increased appreciation on the part of electrical merchants of the value of intensive selling effort.

Associated Manufacturers Co-operate Effectively with Other Bodies

ORGANIZED in 1915 "to advance and protect the interests of the manufacturers of electrical supplies and of the manufacturers of materials entering into electrical construction, in manufacturing, engineering, safety and other problems, to promote the standardization of electrical material, to collect and disseminate information and to promote co-operation among the members," the Associated Manufacturers of Electrical Supplies have attained a company membership speaking through 350 representatives. Besides manufacturing and standardization problems, the association includes in the scope of its activities packing and shipping, the collection and compilation of statistics on commercial and marketing conditions and methods, cost accounting, freight rates, insurance, specification and contract forms, warranties, trade acceptances and the interrelation of the various branches of the industry. Remarkable results are claimed from the work of the general standards committee.

The association co-operates with the Underwriters' Laboratories, the Federal Trade Commission and the electrical committee of the National Fire Protection Association, is a member of the Chamber of Commerce of the United States and the Merchants' Association of New York, and has a tariff adviser constantly looking out for its members' interests as regards import duties.

Electric Power Club Helps to Defeat Bad City Ordinance

STANDARDIZATION of electrical machinery and promotion of a spirit of co-operation among its members for the improved production and increased distribution of electrical machinery and apparatus are the outstanding objects of the Electric Power Club as expressed in its constitution. In accordance with these aims the motor and generator section of the club in the year just past made important recommendations covering the disputed question of 50-deg. versus 40-deg. rating; the word "portable" has been dropped from before the name of the electric tool section to permit this section to deal also with stationary tools; the industrial control section has made good progress in connection with nomenclature, safety and fire hazards and the proper application of controllers, and the power switchboard and oil circuit-breaker section has adopted standard voltage ratings and made many valuable recommendations. The mining and industrial locomotive section, the transformer section and the storage-battery section have also been active, and indications are that very valuable recommendations will soon be made by the last-named section, which is one of the newer ones. In the year which is just past the Electric Power Club assisted very materially in opposing an ordinance introduced into the Chicago City Council whereby it was at first proposed to set up an inspection and testing bureau and to make systematic charges for approval of electrical devices before they could be sold.

Edison Companies Association Has Its Own Field

THE Association of Edison Illuminating Companies, dating back to 1885, has for its special object "the development of the service to the public of electricity for light, heat and power and the promotion of co-operation among its members in dealing with the scientific, engineering and commercial problems involved." The association does not seek general publicity for its activities, deferring to the National Electric Light Association in matters of service to the industry at large, but seeks to serve in those particulars in which its small and compact membership makes it possible to work to better advantage than can the N. E. L. A. with its very large and diversified membership.

Electrical Contractors and Dealers Take Up Costs and Accounting

TO PROMOTE friendly relations between contractors and dealers, to disseminate helpful information among its members, to collect data and issue engineering sheets, to assist marketing, to increase the attractiveness of stores, to elevate installation standards and to co-operate with all industries and associations whose fields touch its own—these, in brief, are the objects sought by the National Association of Electrical Contractors and Dealers, whose membership on June 30 last was 2,322, an increase of 12 per cent over the preceding year, and which has twenty-one state associations. Committee work was actively pushed in 1921. The committee on cost data completed a manual of estimating which is now being used experimentally by twenty or thirty contractors in different parts of the country and has the indorsement of prominent estimators. The committee on central stations has brought about the printing and distribution of several pamphlets on writing and merchandising.

Electrical Supply Jobbers Compile Statistics

THE Electrical Supply Jobbers' Association, which has its general office and secretary in Chicago, has three geographical divisions—the Atlantic, the Central and the Pacific. Each division has a secretary. There is no president.

One of the most important activities of the association during 1921 was the continuation of the work of the accounting and statistics committee. This committee is making a study of the costs of operation by lines of material and is having printed and distributed to members information and instructions for obtaining these costs. The method and forms committee suggested methods and forms for use by jobbers in their shipping, receiving and charging departments.

Statistics showing the total volume of business being done by jobbers throughout the country were compiled.

Electric Hoist Manufacturers Make Extensive Studies

WITH a membership of corporations, firms and individuals actively engaged in the manufacture of electric hoists, the Electric Hoist Manufacturers' Association aims to cover manufacturing, engineering, safety, transportation, standardization and other problems connected with this specialized industry. In 1921 it made noteworthy studies along these lines.

American Welding Society Turns from Sellers to Users

THE American Welding Society, organized to provide united action in extending the knowledge of the art of welding and its field of industrial application, has six sections, established respectively in Philadelphia, Chicago, Pittsburgh, New York, northern New York and Cleveland, and expects soon to establish others in San Francisco, Los Angeles, Portland, Seattle and Spokane. The society has set up as its advisory committee on research and standardization the American Bureau of Welding, and through this bureau investigations are being made of a kind to eliminate duplication and waste and procure results at a minimum cost to the industry. The bureau serves as the connecting link between the National Research Council's division of engineering and both the American Welding Society and the welding industry. The president instanced in his annual address as an outstanding feature of the society's progress the relinquishment of its control by those interested in the sale of welding equipment and supplies and the assumption of this responsibility by the users.

Electrical Safety Conference Keeps Active

FIVE organizations co-operate to promote the work of the Electrical Safety Conference. These are the Associated Manufacturers of Electrical Supplies, the Electric Power Club, the National Workman's Compensation Service Bureau, the Bureau of Standards and the Underwriters' Laboratories. In the furtherance of its constitutional objects—the promotion by co-operative effort of the consistent development of manufacturing and installation practice with regard to accident hazards, the development of safety standards for construction and test, and the interpretation and rendering uniform of electrical safety codes—the special committees of the safety conference have continued actively at work.

Railway and Utilities Commissioners Champion Fair Rates

ALL the railroad and public service commissions of the United States are represented in a national association which meets in convention once a year. Of direct concern to the electrical industry is the determined opposition of the association, as expressed at its convention last year, to government ownership of utilities and its championship of rates fair alike to the utilities and the public. A revised edition of its "Uniform System of Accounts for Electrical Corporations" was printed and distributed by the association.

Fire Protection Association to Extend National Electrical Code

THE National Fire Protection Association has two functions—one to make the standards by the observance of which fire waste may be checked, the other to educate the public to follow them. At its 1921 convention, held in San Francisco last June, the electrical committee reported that the 1920 edition of the National Electrical Code had been submitted to the Engineering Standards Committee for approval as an "American standard" and that this approval had been accorded. A motion to develop the code to cover both accident and fire hazards was passed at a meeting of the electrical committee held last month in New York.

Lighting Fixture Manufacturers Push Standardization

STANDARDIZATION, with especial regard to glassware heels and screw heads, was pushed vigorously in the past year by the National Council of Lighting Fixture Manufacturers, which has grown from twenty to 120 members in three years.

Production of Electrical Equipment and Supplies During Years 1919, 1920 and 1921

Item	1919 (Revised)		1920 (Revised)		1921	
	Number of Units	Value	Number of Units	Value	Number of Units	Value
Insulated Copper Wire:						
Rubber covered	.....	$75,000,000	.....	$85,000,000	.....	$40,000,000
Total code	1,400,000	21,000,000	1,700,000,000 ft.	30,000,000	1,271,000,000 ft.	17,408,000
No. 14 code	1,040,000	10,000,000	1,105,000,000 ft.	11,250,000	890,000,000 ft.	5,785,000
Flexible cords	.....	.....	204,000,000 ft.	.....	95,000,000 ft.	.....
Generators:						
Waterwheel	.....	.....	.....	.....	196,000 kw.	1,100,000
Turbo	.....	.....	.....	.....	510,000 kw.	9,300,000
Motors:						
Fractional	.....	41,000,000	.....	40,000,000	.....	15,000,000
1 hp. to 50 hp	.....	65,000,000	.....	66,000,000	.....	30,000,000
51 hp. to 200 hp	.....	9,000,000	.....	11,000,000	.....	5,000,000
Above 200 hp	.....	2,000,000	.....	4,000,000	.....	1,000,000
Transformers:						
5-kva. and under	300,000 kva.	.....	330,000	.....	.....	.....
Above 5 kva	600,000 kva.	.....	660,000	.....	.....	.....
Distribution type	.....	9,500,000	.....	11,400,000	.....	6,000,000
Power type	.....	11,000,000	.....	13,200,000	1,950,000	6,000,000
Meters, Watt-hour (house type)	2,000,000	.....	2,200,000	.....	1,500,000	.....
Control, industrial	.....	17,000,000	.....	25,000,000	.....	15,000,000
Lamps:						
Type "B"	130,000,000	.....	172,000,000	.....	134,000,000	.....
Type "C"	25,000,000	.....	43,000,000	.....	27,000,000	.....
Carbon	6,000,000	.....	15,000,000	.....	7,000,000	.....
Miniature	70,000,000	.....	105,000,000	.....	105,000,000	.....
Socket Devices:						
Heating appliances	.....	18,000,000	.....	.....	.....	.....
Domestic	.....	16,900,000	.....	23,400,000	.....	14,040,000
Industrial	.....	1,100,000	.....	1,500,000	.....	900,000
Fans	1,000,000	.....	950,000	13,900,000	700,000	10,000,000
Washing machines	500,000	50,000,000	600,000	72,000,000	.....	.....
Vacuum cleaners	600,000	19,000,000	1,025,000	51,000,000	600,000	30,000,000
Wiring Supplies:						
Rigid conduit	.....	15,500,000	140,000 tons	20,300,000	58,000 tons	7,000,000
Non-metallic flexible conduit	.....	4,500,000	100,000,000 ft.	4,700,000	98,000,000 ft.	2,500,000
Metallic flexible conduit	.....	.....	2,300,000 ft.	150,000	.....	100,000
Flexible armored conductor	55,000,000 ft.	.....	71,000,000 ft.	6,400,000	.....	4,000,000
Outlet boxes and fittings	.....	.....	.....	1,800,000	.....	1,200,000
Tape:						
Friction	.....	.....	18,000,000 lb.	.....	10,800,000 lb.	.....
Rubber	.....	.....	2,000,000 lb.	.....	1,200,000 lb.	.....
Fuses:						
Renewable	.....	.....	.....	3,500,000	.....	2,000,000
Non-renewable	.....	.....	.....	3,500,000	.....	2,500,000
Schedule Material:						
Key sockets	12,000,000	.....	13,500,000	.....	7,500,000	.....
Pull sockets	7,500,000	.....	9,000,000	.....	5,000,000	.....
Keyless sockets	4,800,000	.....	5,500,000	.....	2,750,000	.....
Flush switches	9,000,000	.....	9,000,000	.....	6,000,000	.....
Exposed switches	7,500,000	.....	8,000,000	.....	4,000,000	.....
Plugs	7,500,000	.....	15,000,000	.....	8,000,000	.....
Receptacles	7,500,000	.....	15,000,000	.....	8,000,000	.....
Storage Batteries	.....	86,000,000	.....	125,000,000	.....	83,000,000
Starting and lighting	4,000,000	.....	3,500,000	52,500,000	3,200,000	40,000,000
Dry Batteries	50,000,000	7,000,000	65,000,000	.....	50,000,000	.....
Electric Vehicles:						
Trucks	.....	.....	5,000	22,000,000	1,000	.....

Business Outlook for 1922

EVERYBODY IS looking forward to the New Year for release from the period of depression and liquidation, but it is apparent from the viewpoints expressed by manufacturers of different kinds of equipment and jobbers in several parts of the country that only hard work will bring better business.

Conditions More Favorable for Steam-Turbine Business

BY E. H. SNIFFIN
Manager Power Department,
Westinghouse Electric & Manufacturing Company

THE prime movers requirements of the country for 1922 will be large, much larger probably than the business that will be done. For many years there has been a large shortage of power. At the present time this deficiency is not far from 3,000,000 kw. There was a large shortage before the war. Then came the unusual war demand, and although the country's manufacturing facilities were taxed to the utmost, they were not equal to it. Meanwhile the natural increment of increase in power demand has gone on, and although the total power installed has been largely increased, it is no nearer to the country's requirements today than it was.

Electric light and power companies are fully alive to this fact, but income was limited, operating costs excessive, costs for new construction prohibitive, and money scarce. However, the general situation in that respect is rapidly changing for the better. The market for public utility securities is improving, and it will soon be possible for these companies to meet the demands of their growing business. Most of the turbine units purchased during the year will probably go into existing plants. There will, however, be a fair number of new stations started. During the second half of the year we expect to see many large contracts placed.

Meanwhile the manufacturers are devoting the period of comparative business leisure to valuable research work, introducing improvements which will be of great benefit to the art. Greater reliability and lower inherent costs are the ends to be sought. Slight improvement in efficiency can be effected, but not a great deal.

Heating-Device Business to Increase About 25 per Cent

TWENTY million dollars will represent the 1922 volume of heating-device sales, or about a 25 per cent increase over 1921, according to one of the best informed men in the manufacturing end of this business. He based this estimate on the belief that the general business of the country in all lines will be much better next year, with the heating-appliance industry sharing in the increased prosperity. Moreover, during 1921 most jobbers and dealers had large stocks early in the year, and because of frozen credit situations and high inventories these outlets did not always have on order with manufacturers enough goods to maintain even the limited public demand. An era of hopefulness and optimism generally will have a marked effect on the functioning of such distributing channels.

There are no indications that sales of any of the smaller devices will show a larger percentage of increase than any other, but an increased business is expected in electric ranges and cooking appliances. Appliance developments will be toward improved designs of present devices. One exception to this will be a general tendency to standardize on cords and plugs wherever possible.

As to prices, this manufacturer looks for slight declines, which will be put in effect occasionally if the promised reduction in transportation expenses takes place and if the efficiency of labor increases, as it is hoped it will.

Underlying Factors Favor Hydraulic Turbine Business

BY ARNOLD PFAU
Hydraulic Department,
Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

OPINION regarding the outlook for this year's hydraulic turbine business can be formed reliably on the basis of an analysis of the underlying factors and from present indications as they are evident. Power plants consuming fuel, whether coal, gas or oil, can be installed at relatively moderate initial cost, the expense for fuel being continuous and constituting a permanent attachment to the investment. Hydro-electric plants require a relatively large initial investment with very small continuous operating expenses, unless the construction work has been poor, or inferior machines have been installed.

These underlying factors are so widely at variance that they necessarily affect to a great extent the decision as to which construction should be adopted, a hydraulic plant or a fuel-consuming plant. When money and labor are scarce and wages are high, a plant requiring small initial investment and a short period of construction will be built; in other words, a fuel-consuming plant, unless the cost of the fuel delivered to the plant is prohibitive. On the other hand, when money and labor are readily available, when wages are low, then hydro-electric developments can be built to best advantage.

During the war hydro-electric development work was virtually at a standstill, a number of fuel-consuming plants having been installed instead. Now that money and labor have come within easier reach, a revival of hydro-electric construction work can be confidently looked for. The cost of fuel went sky-high during the war and has not yet dropped—nor is it likely to drop—back to pre-war levels, a circumstance which further encourages the development of water power. Many hydro-electric plants were kept going during the war almost under emergency conditions, with regard both to safety of operation and to efficiency. Now that we have

returned to conditions rendering financial economy and commercial efficiency imperative, the operation of such plants has become almost prohibitive, and reconstruction work, which in some cases amounts to complete replacement, has become unavoidable.

All of the conditions cited prevailed during the past year, and consequently a fair amount of contracts for entirely new plants, as well as for replacement and reconstruction, were placed. Since the same conditions still prevail, there is no reason for not expecting a continuation of the present demand for hydro-electric equipment. Abroad, where the scarcity and high price of coal and other fuels are even more pronounced than they are in the United States, the demand is even on a greater scale.

Conditions Favor Better Pacific Coast Business

BY T. E. BIBBINS
President Pacific States Electric Company, San Francisco

NOT being a prophet nor the son of a prophet, my judgment regarding 1922 will be no better than any other, but a review of 1921 may be helpful in developing the estimate for 1922. Last year the jobbing business was notably good in the Los Angeles territory as far as volume is concerned. On account of severe competition for this business, however, profits were materially affected. This volume was due in a large measure to the extraordinary influx of people from the Middle West, necessitating an unusual number of new homes. This was most pronounced in southern California.

The growth of the city of Los Angeles from 10,000 people in 1880 to 600,000 in 1920 has no parallel and the possibility of a city of a million people in the next few years is not a small one. Necessarily the demand for jobbing supplies has been heavy. The indications are that for the first six months of 1922 there will be at least an equal volume.

San Francisco and the territory contributory to it have felt the depressing effect of the labor strike in May, yet the volume of business has been reasonably satisfactory, and the prospects for 1922 are for a slightly better condition. This is because the main commodities which go to make up the state's prosperity have been pretty well sold, particularly raisins, rice and canned fruits. It is also true of lumber. I can see nothing on the horizon which suggests anything but a feeling of conservative optimism.

The Northwest had a most unusual boom due to war activities, which developed shipbuilding and everything that goes with it to an extraordinary degree. Of course, this class of business has had to suffer severe liquidation, which has now been completed. Up to July 1, 1921, wool, canned salmon and lumber had been almost impossible to move. The warehouses of the Northwest were full of these commodities. The general liquidation resulted in the north Pacific Coast going through a very low business condition during 1921, affecting the electrical jobbing business, and few if any of the jobbing houses have done any more than break even. The lumber industry is brightening up. The surplus stock of canned salmon has been greatly reduced, and a number of salmon canneries will probably be operated on full time in 1922.

Taking the Pacific Coast as a whole, I believe the business which will be done by the jobbing houses will be slightly in excess of the combined volume of 1921. My own attitude of mind for the long pull of the Pacific Coast is decidedly optimistic.

No Boom Expected in Wire and Cable Market

PAINSTAKING sales efforts and close attention to economies in manufacture and distribution will be demanded of wire and cable producers in 1922, according to a leading wire manufacturer who discussed the outlook a few days ago with a representative of the ELECTRICAL WORLD. Gradual deflation in business bids fair to continue for some time, in the opinion of this manufacturer. Improvement in the building industry will help the wire market when better conditions are established, but there is a time lag of about nine months between the beginning of building construction and the delivery of wire required, so that even if building should be greatly accelerated in the spring, it would be late in the fall before the wire industry would benefit.

At present wire production is not far from 50 per cent of capacity. Small-order business prevails and the demand for circular-mil cable is at a low ebb. In the new year more or less central-station line-extension work is expected to require fair sales of weatherproof wire, but the cable outlook shows thus far no signs of old-time activity. No definite boom is expected in wire this year, and the problems of reconstruction force upon every manufacturer the closest possible consideration of plant economies and careful expenditures in marketing his product.

The general trend of prices, this manufacturer feels, is still downward, and he expressed the opinion that the prices of both copper and cotton have been artificially inflated within the past few months. Refusal to purchase cotton for factory use followed the late spectacular rise, and so far there has been no difficulty in getting enough raw material for wire production. Labor in wire plants has not had any sharp reductions.

To sum up, the outlook is one to require the American wire manufacturer to scrutinize his plant operations as never before, to pay the closest possible attention to rendering 100 per cent service on the business which he obtains, and to rid his mind completely of the idea that any business is "coming to him on a platter" during the next few years. The electrical industry is not going to stop growing, but competition for business in sight in 1922 is going to put the manufacturer on his mettle in order to obtain his share.

Hard Work the Key to Business in 1922

BY V. C. BRUCE WETMORE
Treasurer Wetmore-Savage Company, Boston, Mass.

FROM the viewpoint of a New England electrical supply jobber it is not possible for me to indulge in the cheerful prophecies of immediate marked improvement in trade that would make such welcome reading. The outlook for 1922 is not pessimistic by any means, but all signs point to a year requiring the hardest kind of work on the part of sales organizations and manufacturers. We shall all earn what comes to us in the new year's business—of that I am confident.

The ability to render prompt service will count not a little. Intelligent study of the customer's requirements will also be demanded in order to serve him economically and efficiently.

Conditions of world-wide importance affect the prosperity of the electrical industry in the United States to a greater extent than many realize. As these conditions improve export trade will grow. This means not only increased sales by American manufacturers to customers abroad, but improved domestic business resulting from enlarged export manufacture and sales. The accomplishments indicated at the Washington conference on armament limitation are generally very encouraging as influencing or being destined to influence world-wide taxation in the direction of reducing enormous burdens of unproductive expense. As successful trade with overseas countries develops the reaction upon business here will favorably affect the electrical industry along with others.

It has been well said that the world is undergoing a period of convalescence, and the United States is no exception. The return to a healthy condition of trade after such an upheaval as the war created takes time. Much as one would like to see a more rapid revival of business, the fact must be faced that hard work is absolutely necessary. Recovery may be closer at hand than can be seen at this writing, but the only safe and sound program is to combine careful and judicious expenditure for business ends with downright hard labor of mind and body, in order that a solid foundation may be built for the great business which ultimately must come with the expansion of the electrical industry.

New and Renewal Storage Battery Business Promising

BY H. B. GAY
Sales Manager Electric Storage Battery Company, Philadelphia, Pa.

THE outlook for the storage-battery business during 1922 is promising. There are two well-defined fields in the sale of storage batteries—new business and renewals.

New business is naturally greatly dependent on general conditions. As the process of readjustment continues the industry will feel not only the new buying but also the accumulated demand. This latter applies particularly in certain fields. It is a well-known fact that the railroads of the country have limited their purchases to the minimum during the past few years. This policy cannot be continued indefinitely, and it is the general feeling that they are reaching a point where they must go into the market and place not only new business but also orders for material held up in the past but which will be absolutely needed at this time. A similar situation exists in connection with the farm-plant business. Declining prices of food stuffs and the general situation have held up farm improvements. This field should also open up with better conditions.

The renewal business is also affected by existing conditions but not as much so as new business. The storage battery is an essential and indispensable part of many different kinds of electrical systems, units and apparatus, and the field for renewals is therefore not a matter of conjecture but a well-defined fact. A battery that has performed its work and is worn out must either be renewed or eliminated. In many cases elimination is impossible. This means that as the curve of general business moves to higher levels the replacement demand will become more and more insistent.

Another point which should accelerate buying in 1922 is that prices on storage batteries have undergone a considerable reduction and have now reached a stabilized level. The industry as a whole has passed through the liquidation period as well as any of the larger industries, and there is every reason to look forward to a satisfactory battery business in 1922.

Southwestern Jobber Expects Improved Demand

BY J. L. BUCHANAN
President Wesco Supply Company, St. Louis, Mo.

THE outlook in the jobbing field of the St. Louis territory is encouraging. No rush of business is anticipated, but, instead, a gradual development, and one or two years may be required to bring what may be termed really good business. The key to the situation at present is more in the industrial field than in agriculture, and each readjustment made in furtherance of industrial activity will better jobbing business. Of the readjustments which are vital to better business, lower freight rates and labor costs are pre-eminent. Needed construction work awaits both.

There is a growing tendency to make municipal improvements, particularly in towns of 3,000 population and less. There is considerable agitation in such towns for "white-way" systems and for better outdoor illumination in general, so that good business from this source by next spring is expected. Business will probably be slack in rural transmission extensions, because farmers have little ready money, but the field of transmission extensions to municipalities is quite promising.

Improved demand should be experienced in virtually every line of electrical goods, when compared with the year just closed.

Analysis of 1922 Wiring-Device Sales Outlook

BY FRANK V. BURTON
Sales Manager, Henry D. Sears, Boston, Mass.

MANUFACTURERS of wiring devices look forward into 1922 with mixed emotions. Last year was a testing time for many, and from all it required courage to grapple with the many extraordinary problems that were the inevitable accompaniment of the process of deflation. Nevertheless, it is probably true that the majority of wiring-device manufacturers greet the new year with buoyant enthusiasm.

The wiring-device business gets its demand from four principal sources: (1) The electrical equipment of new buildings, (2) the repair and extension of existing electrical equipment, (3) the wiring of unwired buildings (principally residences), and (4) manufacturers who purchase wiring devices to sell as part of their finished product.

During 1921 wiring-device manufacturers depended mostly on the second and third sources for their existence, for it is a well-known fact that conditions in the first and fourth were decidedly subnormal. What of 1922?

(1) The number and value of building permits since Sept. 1 has been one of the extraordinary phases of

this very extraordinary year. In normal times building activity decreases with the approach of cold weather, but in 1921 it was just the reverse. It is a hopeful index that building costs have now descended to a level where investors will resume their operations, and therefore a comparatively broad program, especially of residences and apartment houses, can be expected throughout the year.

(2) This class of demand is largely confined to the fall of the year, when the shortening days remind people of the inadequacy of their existing equipment. It is more or less steady year in and year out, and no great increase can be expected this year.

UNWIRED HOUSES OFFER OPPORTUNITY

(3) Unfortunately, this class of business is by many treated as a forlorn hope, to be attacked when all else fails. ELECTRICAL WORLD figures on the number of unwired buildings indicate clearly that there is plenty of profitable work in sight for years to come. No longer does a lighting company's transmission line define the limits of the fertile territory. The so-called farm-lighting plant has made of every human being anywhere a "prospect" for electric energy.

(4) Wiring devices bought to equip lighting fixtures required for new buildings are assumed to have been considered under (1), but in this classification are those required for table and stand lamps as well as for the constantly growing array of socket devices. Many appliance manufacturers have wallowed in the depths during 1921, but the sound ones have survived and are planning their 1922 sales campaigns with magnificent courage and resource.

The analysis reveals, therefore, that during the first six or eight months of this year the wiring-device business will be sustained on about the same level as during the close of last year and that it will broaden considerably during the late summer or early fall.

NO IMPORTANT REDUCTIONS EXPECTED

It is doubtful if there will be any important price reductions on wiring devices during the year. Since the late summer most manufacturers in this line have based their selling prices on the replacement costs of raw materials, deliberately ignoring the prices paid for materials in stock. Current prices on commodity items represent a level nearly two-thirds of the way down from the high level of 1919 to the 1914 pre-war level. How much further they will descend is any one's guess, but it is perfectly safe to say that future reductions, if there are to be any, will be fractional and at widely separate periods.

Two subjects in particular can well receive the attention of the entire electrical industry, and all will benefit in proportion to the success of the endeavor. One is the sales education of the wiring contractor and the other the electrical education of the architect.

Altogether too much effort has been expended in endeavoring to make of the neighborhood electrical contractor a dealer in electrical appliances and not enough in educating him to be a salesman of wiring equipment. An electric flatiron is of no service whatever in an unwired home, and the utmost convenience cannot be obtained from an electric toaster when there is only one outlet in the dining room and that in the ceiling.

The year 1922 should be a good one, anyway, but intelligent co-operative effort will make it better.

Outlook Depressing in the South

BY W. R. HERSTEIN
Vice-president and General Manager
Electric Supply Company, Memphis, Tenn.

IN THIS section I believe that the lines that will be affected most immediately after Jan. 1 will be electrical household devices and pole-line material—the first because negro labor in the South is now cheap and plentiful and the white Southern woman is no longer interested in labor-saving household devices; the second, because the sale of utility securities is being seriously retarded by state and municipal bonds, which are now being freely offered on account of the ready market brought about by their tax-exempt features. I do not believe the utility companies are going to have any great amount of money to spend. From what I can see, the tendency of prices will be to continue downward, particularly as labor becomes liquidated.

In spite of the depressed outlook, however, we are advising our customers to maintain adequate stocks and are ourselves following this policy. We are doing this because we do not believe there are enough electrical goods in existence to supply the demand if it should suddenly become normal. So many manufacturers have shut down, or are working part time that it seems to us there cannot possibly be a surplus of electrical material in existence. While we believe that a jobber's warehouse stock is more of a liability than an asset at the present time, and that it is continually decreasing in value on account of price changes, at the same time any jobber or dealer who is careful of his reputation for service must maintain an adequate stock.

Continued Improvement in Washing-Machine Sales Expected.

BY E. B. SEITZ
Secretary American Washing Machine
Manufacturers' Association

THE year 1920 was the peak year in machine sales, reaching a total of $85,000,000. However, December, 1920, was the valley, sales dropping to about 30 per cent of the year's monthly average. Beginning with January, 1921, this percentage began climbing month by month until June, when it dropped back slightly. The climb started again in July, and each month since has seen a gain over the preceding month's sales. This statement is made before the November statistics are available, and it would occasion no surprise if both November and December should fall slightly under October as there will be no forward buying against the inventory-taking time of Dec. 31.

Throughout the year the washing-machine sales have been spotty with certain sections of the country doing virtually a 1920 business while others gave up early and never recovered. It has been noted and commented on throughout the year that not a single exception had been cited against the general statement that heroic sales effort was needed to market washing machines during 1921 and that the results in every case had justified the efforts.

For 1922 a much improved market is anticipated. Many manufacturers believe that there will be as many units sold in 1922 as in 1920. Much will depend upon what disposition is made of outlaw and dumped machines. If they are allowed to glut the market, dis-

couraging legitimate dealers and educating the public to a fictitious price, then 1922 will be a most gloomy year.

Outlook in the Southeast Interesting as Well as Excellent

BY WILLIAM FARR
President Piedmont Electric Company, Asheville, N. C.

IT SEEMS to me that we are considering too closely the fluctuations in business that have occurred in the past few months as a result of adjustments and for that reason have to a great extent neglected to steer a straight course. Looking forward from an experience of nearly a quarter of a century in the electrical business, the outlook for 1922 is excellent, and in addition it is most interesting. We have with us an ever-increasing market for electrical materials and appliances, not only the result of the natural increase in population, but by reason of the movement of the farming population to small towns and larger cities. In my own State of North Carolina, for instance, while the last census gives us an increase of 16 per cent in population, 54 per cent of that increase went into the towns and cities.

Considerable building is being done, most of which seems to be in new residences or remodeling old buildings. This makes a good demand for electrical construction material, and the electrical jobber is pushing along this line, sometimes to the extent of forgetting profits, and is neglecting the big market for appliances and electrically operated labor-saving equipment because it requires new selling methods. However, one of the weak links in the sale and distribution of supplies and appliances today is the dealer's neglect of the opportunities in his own town. When the contractor and dealer are separated both will be benefited.

The need of the hour is sales ability along creative lines, and whatever can be done to develop this will take the sag out of the electrical or any other business. Otherwise we are going to have a lopsided market with a lopsided sales organization and competition to a profitless point. The principal problem is to reduce overhead.

Hope for New Year in Rocky Mountain Business

BY J. A. KAHN
President Capital Electric Company, Salt Lake City, Utah

LOOKING back over the trail we have come would beget pessimism; looking forward, there is hope. To say that the past year has been a prosperous one for electrical supply jobbers of the Intermountain country would be decidedly inaccurate. There have been several big adverse conditions to contend with.

The shutdown of the big copper plants the first of April was nothing short of a blow to Intermountain prosperity. Its first result was to throw out of work 8,000 laborers engaged in copper production and indirectly to cause other loss of employment at the coal mines, the mills and the smelters. This materially reduced the active market for electrical supplies.

Wool, one of the big staples of the Mountain States, was also hard hit. The precipitous falling off of the market was disastrous to hundreds of sheep men. It will take several years of hard struggling to liquidate notes and get this industry stabilized once more. Stock raisers likewise suffered a severe setback. Sugar-beet growers have hardly been able to meet expenses this year. The hay crop was good, but there is no market.

Added to these reverses there have been a number of country bank failures, with far-reaching and detrimental effect. There is scarcely an important industry that has escaped the blight of business depression.

It is rumored that the Utah Copper Company will resume operations to 40 per cent capacity the first of April. This would go a long way toward renewing hope.

The year 1921 will show about 60 per cent of the 1920 volume of business in the electrical supply jobbing trade, making this the leanest year since 1916. The greatest shrinkage has been shown in the department of household appliances, with industrial, pole-line material and building material following in order.

But there is a way out, and through co-operation and hard driving the jobbers are going to find it. Our immediate task is to spur the retailer on to more courageous and intensive selling. He must widen the outlet to the consuming public, and hence he must be schooled in modern methods of merchandising.

Better Transformer Sales Are Expected in 1922

BY M. O. TROY
Manager Transformer Sales, General Electric Company, Pittsfield, Mass.

COMPARED with the situation a year ago, the outlook for transformer sales is distinctly encouraging. Looking at the 1921 record of this market, it is apparent that the upward trend from the low point in the sales curve, which was reached last June, has on the whole been well sustained, and there is good reason to believe that a healthy advance will continue. It is reasonable to expect 20 per cent increase in kva. production during the new year as compared with 1921.

Public utilities are relatively very large buyers of transformers. The extension of central-station service is certain to continue to add many new customers to the outlying portions of distributing systems, and within the present lines of such companies there is still room for intensive development of business which will require material. The money market is so much more favorable to developments of this kind that a substantial expansion in central-station service may be anticipated.

From the manufacturing viewpoint, conditions are such that even a rapid increase in demand can be cared for with little difficulty. Where efficient organizations have been held virtually intact as regards "key men," with curtailed hours of production instead of full time by more reduced forces, the full stride of production can be attained very quickly. This gives reason to expect excellent deliveries all through 1922. The material supply situation is well in hand also. Progress has been made in gaging the amount of material necessary for anticipated volumes of production and in working to avoid an undue surplus.

It is doubtful if any expectation of further price changes will much affect the transformer market this year. The moderate advances in this class of apparatus during the war period have been quite well liquidated, and it is fair to say that this branch of the industry appears to have settled into a pretty stable condition in this regard. Altogether the outlook is conservatively encouraging, and as world-wide conditions improve a genuine expansion of manufacturing activity may confidently be expected.

Letters from Our Readers

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

Concerning the Light of Other Days

To the Editors of the ELECTRICAL WORLD:

About a month ago I retreated into Colonial times and have since been more or less cheerfully studying the means of illumination which our worthy and ingenious ancestors possessed. The storm hereabouts put out of commission a large proportion of all overhead circuits, and in my particular district the trees went down until they formed veritable chevaux-de-frise that required a good many days of sustained effort to clear away.

Having plenty of candlesticks and no lamps, my retreat was truly into the Colonial period, for even if I had possessed lamps of pre-revolutionary days, no whale oil would have been available for them. A fortnight's experience with candles has given me a better appreciation of their value and of the ingenuity of our ancestors in their use than could otherwise be attained. Of course, my candles contained one great improvement over the eighteenth-century variety in the braided wick, which bends over and burns off clean instead of requiring the use of snuffers. As to the illuminating effect I found that one could read or write quite comfortably by the help of eight or ten candles—a couple of candelabra in full action, and close together, proving satisfactory.

Nor did the candle flame when thus used fairly in the field of view prove in the least disagreeable. The intrinsic brilliancy of the flame is somewhere about 3 cp. to 4 cp. per square inch, and what is of more importance, the total luminous energy received from a single flame is very trivial. A 100-watt lamp shaded to a similar brilliancy would have been very unpleasant, and the condition actually found is an effective demonstration of the necessity of taking into account quantity of energy as well as intrinsic brilliancy in dealing with the subject of glare.

The illumination as measured by the candle-meter ranged from 1 foot-candle to 2 foot-candles, as might be expected, which is about the minimum for reading purposes. It also became very obvious why our ancestors turned to some of the fixtures characteristic of their time. The candlestick placed on a table is too low for general lighting except at very short range. It worked well enough in a living room or even in a kitchen where the cook worked at a low fireplace. As a kitchen light at the present height of ranges the candle proved a dead failure, and one began to appreciate the reason for sconces, particularly the mirrored kind, and *torchères* supporting long candles and giving some downward light. The chandelier too becomes an obvious fixture after experience with candles, it being the only means of carrying the light high enough for any general illumination in a large room.

Another blending of theory and practice appeared when using the candle meter. To keep candles working nicely they must not be too near together; hence our ancestors used somewhat spreading candelabra, the more since they had no hard paraffine candles. Hence the light falling on one's book came from scattered areas, and the effective component of the illumination varied widely so that the effect of my eight candles did not add up at all fully to an 8-cp. lamp. The same difficulty would appear in using any large area of low luminosity.

From a purely sordid standpoint the candle is not a success, and the reason for its rapid displacement by kerosene lamps is clear enough. Even though I purchased candles at sixteen for a quarter at an army supplies shop, one cannot consider them, from the standpoint of economy, as a competitor of the electric lamp or of anything else in the line of modern illuminants. But they served their turn well for a brief period and gave an insight into the early technique of illumination not easy otherwise to obtain.

LOUIS BELL.

Boston, Mass.

The Deadly Kite

To the Editors of the ELECTRICAL WORLD:

When Benjamin Franklin risked his life in flying the historic kite in experiments destined to lay the foundation for later-day understanding and control of electricity, the menace of lightning discharges under which he worked was as nothing compared to the chance small boys take, in this era of high-tension power lines, when they persist in the practice of substituting fine wire for the time-honored kite string. From California comes the latest story of a tragedy traced to this more and more frequent practice among youths. One man was killed in Los Angeles, one boy crippled for life and two others were so badly burned that they were confined to the hospital, because one progressive youngster used a metal string for his kite.

Michigan, too, has had experiences of this nature. Only last August a boy in Flint was killed in a very similar accident. The records of the Consumers' Power Company contain two other instances, one in Flint and the other in Lansing, where only good fortune prevented loss of life. Reports of the Los Angeles accident have inspired the central safety committee of the Consumers' Power Company to sound a note of warning to Michigan boys against the practice of using metal strings on kites. The company is laying great stress on the accident-prevention movement both inside its organization and outside.

In this era of rapidly increasing use of toy wireless equipment and other electrical toys fine copper wire is becoming more and more available to the boys. All boys enjoy flying kites, and most of them realize the superiority of a fine wire over heavy cord in getting altitude for their paper ships. Too much stress cannot be put upon the warning against this practice, and sooner or later unquestionably it will be a subject for protective legislation. In the meantime it seems to me it is the duty of every public official, every school executive and every parent to point out to the boys the immeasurable danger and menace in the use of kite strings that will provide a conductor for electrical currents.

H. J. BURTON.

Consumers' Power Company,
Jackson, Mich.

Digest of Electrical Literature

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Locating Faults in Direct-Current Armatures.—B. A. BRIGGS.—Various conditions are discussed under which grounds may occur in an armature. Instructions are given for testing for grounded coils with a lamp and for cutting these coils out of circuit.—*Power*, Dec. 13, 1921.

Commutator Insulation Failures.—J. L. RYLANDER.—Enumeration of the common causes of failures of commutators, together with methods of preventing these failures. The effect of copper, carbon or ore dust and of oil is explained. The proper materials for construction and the correct methods of putting commutators together are outlined.—*Electric Journal*, December, 1921.

Lamps and Lighting

Incandescent Lamp Temperatures as Related to Modern Lighting Practice.—CHESTER C. DOWS and WILLARD C. BROWN.—This paper, which is based on experimental work carried on for several years, is intended to clear up questions on the operating temperatures of incandescent lamps. The material presented is in four parts—(1) temperatures of lamps without reflecting and diffusing equipment; (2) temperature of lamps with reflecting and diffusing equipment; (3) ventilation versus non-ventilation, and (4) suggestions in the use of incandescent lamps under special temperature conditions.—*Paper presented before Illuminating Engineering Society.*

The Lighting of Printing Plants.—A. D. BELL.—A discourse on the general requirements of printing plants and the special needs of the different departments, including the type-making and composing rooms, the photo-engraving room, the press room and the bindery. Layouts of lighting units for these locations are suggested and certain mounting heights and lamp sizes are recommended.—*Bulletin L. D. 125, Edison Lamp Works of General Electric Company.*

Generation, Transmission and Distribution

Heat Balance in Steam-Power Plants.—E. L. HOPPING, J. H. LAWRENCE and W. M. KEENAN, and C. W. E. CLARKE.—Particulars of systems employed to adjust the rate of steam-generation demand with the least possible waste of heat and expenditure of coal in the Delaware station of the Philadelphia Electric Company, the Hell Gate station of the United Electric Light & Power Company of New York City and the Colfax station of the Duquesne Light Company are given.—*Journal A. S. M. E.*, December, 1921.

Boiler and Furnace Economy.—D. S. JACOBUS.—This paper deals with such questions as when it will pay to use economizers in a new plant, the most economical rating at which to operate a boiler, limitations imposed on efficiency by inability of furnace brickwork to withstand temperatures available with many classes of fuel, furnace volume and length of flame travel, where air heaters are of especial advantage, importance of employing properly trained men for boiler operation, information afforded by flue-gas analysis, etc.—*Journal A. S. M. E.*, December, 1921.

Electrolytic Protection of Steam Boilers Against Scale and Corrosion.—W. PHILIPPI.—A description of a method said to be successful in protecting steam boilers against their two greatest enemies, corrosion and boiler scale. Careful investigations of corrosion on boiler bottoms, water tubes and condensers proved that electrolytic action was the cause of these damages. Owing to the different electromotive forces set up in different metals used in the construction of boilers, condensers, etc., in connection with conducting water, currents circulated from these metals through the water and sooner or later caused corrosion. But it was also found that in many cases erratic currents from electric railways or poorly insulated exciters entered a boiler and caused corrosion. A remedy that suggested itself was to employ a metal of higher emf., like zinc, to be connected electrically to the endangered boiler and to create in this way a counter-emf. to compensate for the corrosive current. But this method did not always give complete satisfaction, as it was impossible to regulate the current in the way made necessary by the different conductivity of the water used. To use an externally generated direct current and to apply this through electrodes into the boiler was found to give a perfect remedy. In fact, by doing this the small but constant generation of hydrogen along the boiler walls will also effectively prevent the formation of boiler scale. A direct-current voltage of from 10 to 20, at a current density of about 2 milliamperes per square foot, was found to be most effective. A small motor-generator of 6 kw. may supply a battery of thirteen boilers, each of which may have four protective electrodes. A small resistance in series with each electrode circuit permits suitable regulation of the voltage. Ordinary wrought-iron gas pipes are used as electrodes. Experience with this protection, extending now over several years, has surpassed all expectations. On boats using sea water in the condensers, for instance, no corrosion of any kind was observed after months of operation, while before installing the electrolytic protection it was necessary to clean them every few weeks.—*Siemens Zeitschrift*, October, 1921.

Traction

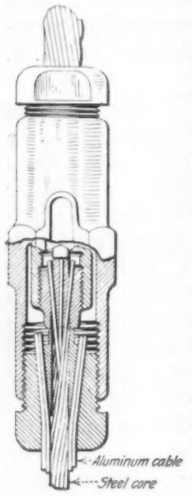
Third-Rail Systems of the United States.—Various types of construction used on elevated, subway, interurban and steam-road electrification systems are described in this article. Conditions which affect the construction, such as those of traffic, topography and climate, are described for each case. Numerous diagrams illustrate the design of different third-rails.—*Electric Traction*, November, 1921.

Developments in Railway Electrification.—Details of an extended suburban and main-line scheme in the Lon-

don suburban area, extending as far as Brighton, Eastbourne and Worthing. Advantages of the lower cost of electrical operation and the improved service and traffic facilities are discussed.—*Electrician (London)*, Nov. 25, 1921.

Installations, Systems and Appliances

Power Station at Sheffield, England.—An account of the construction and equipment of the new generating station of the Sheffield Corporation, which has a capacity of 35,000 kva. Of especial interest is a portable ash crusher which may be placed under the receiving pit of any boiler. The ashes are passed through this crusher, which is driven by a 10-hp. motor, and thence they are delivered into cast-iron suction pipes and drawn into ash-receiving tanks.—*Electrical Industries*, Nov. 23, 1921.



CONNECTOR FOR STEEL-CORE ALUMINUM CABLE

High-Voltage Line Hardware.—CH. LAVANCHY. — Descriptive article describing and illustrating a great many special accessories used on modern high-voltage lines to join wires and to fasten them to the insulators. Suspension-type insulator hardware, however, is not included. Of special interest is a concentric, solderless wire connector system "Pairard," intended for bimetallic conductors, such as an aluminum cable with a steel core. This device clamps the two metals separately.—*Revue Générale de l'Electricité*, Nov. 19, 1921.

Individual Motor Drive for Spinning and Twister Frames.—GEORGE WRIGLEY.—The article discusses the proper size and type of motor and connections for driving spinning and twister frames for textile mills. An interesting diagram is given showing power required for different parts of a spinning frame.—*Electric Journal*, November, 1921.

Developments in Power-Station Design.—Continuation of a series on the subject, the present article dealing principally with coal and ash-handling equipment.—*Engineer (London)*, Nov. 25, 1921.

Power-Factor Correction and Its Relation to Plant Operation.—P. VANDERWAART.—A description of methods used in an industrial plant to find the causes for low power factor and remove them as far as possible. After a survey of one department, motors were rearranged to fit the loads and the power factor was raised from 78.4 per cent to 83.8 per cent. The power factor at maximum demand was raised from 76.5 per cent to 82.1 per cent. This was in a plant with 258 hp. maximum demand and 424 hp. connected load before the change (319.5 hp. after). The cost of changing the motors was $1,500, while the price of the motors released is $2,640.—*Paper read before the A. I. and S. E. E.*

Electrophysics and Magnetism

Methods of Magnetic Testing.—T. SPOONER.—Methods for testing the magnetic properties of iron used in the cores of transformers and motors are described. Various apparatus for determining the eddy current and the hysteresis losses and means for separating these losses are discussed at some length.—*Electric Journal*, December, 1921.

Electrochemistry and Batteries

Electric Iron and Steel Plant for Brazil.—N. A. V. PAULSSON.—The installation described, the first of its kind, includes two Swedish pig-iron furnaces, two Bessemer converters, a Ludlum steel furnace and two merchant mills, all driven by electric power and heated by electric energy.—*Chemical and Metallurgical Engineering*, Dec. 7, 1921.

Electrodeposition of Metals.—W. E. HUGHES.—One of a series of articles. The one now noted deals with depositing lead. A number of uses for lead coatings are mentioned. Three types of lead baths have been used successfully in plating. Their methods of application and the resulting products are explained.—*Beama*, December, 1921.

Units, Measurements and Instruments

Acoustic Impedance and Its Measurement.—A. E. KENNELLY and K. KUROKAWA.—This paper describes the measurements of acoustic impedance and offers a technique for such measurements in the laboratory.—*Publications of Massachusetts Institute of Technology, Serial No. 27.*

Measurements of Three-Phase Wattless Power.—G. W. STUBBINS.—Some methods of integrating wattless power without the use of special meters are discussed. Use is made of various taps on the windings of the instrument transformers.—*Beama*, December, 1921.

Telegraphy, Telephony and Signals

Transmission Characteristics of the Submarine Cable.—JOHN R. CARSON and J. J. GILBERT.—Besides providing a method for accurately calculating the transmission characteristics of a submarine cable, the analysis given leads to the following general conclusions: (1) Contrary to usual assumption, the "sea-return" impedance is by no means negligible; (2) the armor wires which surround the cable and which are necessary for mechanical protection have a very pronounced effect on the impedance of the sea return and even at moderate frequencies may become the controlling factor; (3) the rapid increase in the impedance of the armor wires with frequency and their pronounced and even controlling effect on transmission make a thoroughgoing study of their rôle in the electric system a matter of first-class importance; (4) at relatively high frequencies the return impedance, and hence the attenuation and the distortion, may be very greatly decreased by a correctly designed thin metallic sheath concentric with the core and in electrical contact with the armor wires.—*Journal Franklin Institute*, December, 1921.

Miscellaneous

Use of Electric Vehicles for Municipal Purposes.— F. AYTON.—Advantages of electric vehicles are brought out as regards length of service, permanency of economical energy supply, cleanliness and reliability. Comparisons between the cost of operating electric vehicles and the cost of gasoline-driven trucks or horse-drawn vehicles are shown to be always in favor of the electric truck.—*Electrician (London)*, Dec. 2, 1921.

The St. Lawrence River Power Development.—The salient features of a report by Hugh L. Copper to the International Joint Commission on navigation and power in the St. Lawrence River. The report recommends Croil Island as a site for the main dam and power plant.—*Canadian Engineer*, Dec. 1, 1921.

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

All Branches of the Industry to Co-operate for Better Business

MANUFACTURERS, jobbers, contractors and dealers have been invited to meet with a number of central-station-company members of the National Electric Light Association in New York on Monday of next week to consider the program for the "more business—better business" movement about to be launched by the association. Invitations to this meeting were sent out by President M. R. Bump after meeting with First Vice-president Frank W. Smith, R. H. Tillman, chairman of the Commercial Section, and M. H. Aylesworth, executive manager of the association, for the purpose of outlining a comprehensive and constructive program.

At the meeting on Monday it is proposed to discuss ways and means, lay plans for making this movement simultaneous throughout the country and start the ball rolling for a revival of commercial activity in which the electrical industry will take the lead in building better business of all kinds.

Colorado River Commission to Meet This Month

A MEETING of the Colorado River Commission will, it is expected, be called by Secretary Hoover on Jan. 26. The meeting will be held in Washington. Later it is the intention of the commission to hold hearings in the Southwest. At the Washington meeting a general plan of procedure will be agreed upon and limits placed on the scope of the work which the commission will undertake.

First Unit in Calumet Plant Started

THE first 30,000-kw. unit in the Calumet plant of the Commonwealth Edison Company, in the southern part of Chicago, was started on Dec. 28. The installation in this plant will for the present consist of two 30,000-kw. units, though when completed the station is designed to have a capacity of at least 180,000 kw. This plant will eventually be balanced by a station of more than 200,000 kw. rating to be built by the Public Service Company of Northern Illinois on the shores of Lake Michigan at Waukegan, Ill. With the existing Fisk, Quarry and Northwest stations of the Commonwealth Edison Company in Chicago, the two new stations are expected to become the hub of a great network of transmission lines in the upper Mississippi Valley that even now extend well toward Minneapolis on the north and to the coal fields of Kentucky and close to St. Louis on the south.

In connection with this growth of electric service a recent announcement revealed the purchase of a piece of lake shore property near the Indiana-Illinois state line that is designed for eventual use by the Insull interests as another power-plant site. This will be in the vicinity of the large industrial developments in the southern part of Chicago and its adjoining territory, and the plant when erected will be one in the group formed by the plants mentioned above. No plans are as yet contemplated for the plant on the lately purchased site, and there probably will be none made for some time.

Governor Miller Advocates Amendment of New York Water-Power Law

TWENTY-ONE applications for preliminary permits and licenses for the development of water power under the act passed at the last legislative session have been made, Governor Miller of New York State said in his annual message this week, but no licenses have yet been granted, as the commission is proceeding slowly and endeavoring to make sure that the law is adequate to protect the public interest. The Governor, who is firmly convinced that the development of water power under private enterprise is "the only policy that offers any prospect for the economical and efficient development of the potential water power of the state," estimated at 1,000,000 continuous horsepower in interior streams alone, explained that the commission would report to the Legislature with recommendations for needed amendments to perfect the law. The Governor suggested that the state should grant licenses for the development of power for general distribution, not for private use. The statute now provides for granting licenses to municipalities. "I think," the Governor said, "it might well provide for a preferential right in municipalities to purchase on the terms prescribed by public authority power developed under a license from the state. Of course, such a preferential right should not be permitted to interfere with other disposition, if not exercised, and unless exercised within a given time of notice of the quantity of power available such power should be released from such right to purchase.

"The surplus waters of the canal present a different problem," the Governor went on. "They are a by-product. Navigation is the primary purpose of the canal. Any use of the surplus waters must be entirely subordinate thereto. That subordination can only be effectively secured, in my opinion, if the development of power from the surplus waters and the maintenance of the canal for navigation are under a single control. It would not do to incur any risk of subordinating navigation to the needs of power users. It is estimated that 40,000 hp. can be developed from the canal surplus."

The Governor recommends the passage of an act authorizing the Superintendent of Public Works to sell the use for power of the surplus waters of the canal where practicable at public letting and an appropriation of $1,000,000 to start at once developments at Crescent Dam and Vischer's Ferry.

Providence Company to Issue $2,720,000 New Stock

DIRECTORS of the Narragansett Electric Lighting Company, Providence, R. I., voted at a meeting held Dec. 27 to issue capital stock to the amount of $2,720,000. The stock will be dated April 1, 1922, and every stockholder of record at the close of business Feb. 4 will have the right to subscribe for the issue at par, or $50 per share, in the ratio of one share of new stock to each five shares held by him on the foregoing date. Payments may be made in full by April 1 next or in three installments of 30, 30 and 40 per cent by Oct. 2. Six per cent interest per annum will be allowed on partial payments. Subscriptions will be received and rights transferred at the company's offices from Feb. 4 to 25, at noon. Franklin L. Hall is secretary. Expansion of business and plant requires the new issue to be made.

Oklahoma Utilities Association Convention Set for March

THE fourth annual convention of the Oklahoma Utilities Association will be held March 14, 15 and 16, at Oklahoma City. Interesting exhibits by electrical and gas manufacturers, jobbers and suppliers will be features of the convention. Prominent speakers in the public utility industry are being engaged by the committee in charge of the arrangements. New officers will be elected at the convention.

New Orleans Negotiations May Be Resumed

THE negotiations between the security holders of the New Orleans Railway & Light Company and the members of the Commission Council which were so abruptly terminated about two weeks ago by the State Supreme Court, just as the finishing touches were being put to the modified Maloney plan of settlement of the city car troubles, may now be resumed, if only temporarily, under a decision just rendered by Judge Porter Parker of the Civil District Court.

Judge King, of another division of the Civil District Court, on June 30, 1921, at the instance of the Attorney General of the state, issued an order on the city of New Orleans, the Commission Council and Mayor McShane to show cause why they should not be enjoined from entering into an agreement with the public utilities company for a rate of car fare in excess of 5 cents.

A suspensive appeal sought by the city was denied by the court and upheld by the State Supreme Court, the high court holding that Judge King was right in refusing to grant the appeal and that application for a dissolution of the injunction, which the city sought, should be made to the lower court. At this stage the negotiations between the city and the security holders in the trolley company were broken off and the conferences halted until the opinion of the lower court could be had.

Judge Parker, in his decision, took cognizance of only one of the exceptions of the city, namely, that the action instituted by the state was premature, the court holding that the city was well within its rights in negotiating with the New Orleans Railway & Light Company and could not be prevented from adopting an ordinance affecting street-car rates unless the ordinance so adopted was illegal and ultra vires. In the latter case an appeal to the courts to restrain the city from enforcing the provisions of the ordinance would lie. It was anticipated that the court would pass upon the validity of the authority which the city assumed as a rate-making power in the negotiations interrupted by the Supreme Court. This question, however, is unaffected by the decision of the lower court.

Plan for Reorganization of the American Cities Company Ready

AN AGREEMENT for the reorganization of the American Cities Company has been prepared by the committee formed to deal with the company's 5/6 per cent collateral trust bonds and now awaits ratification by the holders of certificates of deposit. The American Cities Company controls six Southern electric companies —the Birmingham Railway, Light & Power Company, the Houston Lighting & Power Company, the Knoxville Railway & Light Company, the Little Rock Railway & Electric Company, the Memphis Street Railway Company and the New Orleans Railway & Light Company. All of these except the New Orleans company will be affected by the new plan.

Three of the subsidiary companies—those at Birmingham, Memphis and New Orleans—are in the hands of receivers. The New Orleans company will be disposed of in accordance with a decision reached a year ago, the Chase National Bank of New York taking over the American Cities Company's interest in this subsidiary company in exchange for interests held by the bank in several others of the six companies controlled.

It is planned to operate the Memphis street railway in combination with the gas and electric properties owned by the Memphis Gas & Electric Company, which has defaulted on bond interest (see ELECTRICAL WORLD, Nov. 26, 1921, page 1089). Through holders of a substantial majority of the bonds in default an arrangement for such a combination has been made.

To carry out the plan a new company, known as the National Power & Light Company, has been organized under New Jersey laws. Its shares, both common and preferred, are without par value. The preferred stock is entitled and limited to dividends of $7 per share per annum, cumulative from Jan. 1, 1923, and is redeemable after three years from date of issue at $110 per share, and cumulative dividends upon the vote of not less than a majority in interest of the outstanding common stock. The National Power & Light Company will also issue fifty-year 7 per cent income bonds, subject to the prior payment of all indebtedness now or hereafter outstanding. With these bonds and the preferred and common stock of the company, in stipulated proportions, it will buy the defaulted bonds of the Memphis Gas & Electric Company.

The Electric Bond & Share Company is to assist in the reorganization as planned, and the further supervision, development, financing and engineering of the new company and its subsidiaries will be in its hands. The National Power & Light Company will offer to the holders of preferred stock of the American Cities Company the right with respect to every full twenty shares of said stock to purchase a block of securities of the National Power & Light Company consisting of a fifty-year 7 per cent income bond for $100 principal amount and seven shares of common stock for $262.50. The Electric Bond & Share Company and Isidore Newman & Son have agreed to purchase from the new company

sufficent of these blocks to insure the company a total of $2,000,000.

The companies that will be controlled by the National Power & Light Company, if the plan is adopted, serve an aggregate population of approximately 757,000 and supply electric light and power to approximately 108,000 customers.

Prominent Electrotechnicians to Take Part in A. I. E. E. Midwinter Meeting

THE tenth midwinter convention of the American Institute of Electrical Engineers will be held in New York City on Feb. 15-17, in the Engineering Societies Building. In addition to the technical papers, the program will include the presentation of the Edison medal for 1921 to Cummings C. Chesney, a lecture on some recent advances in electrophysics, excursions to various electrical operating companies and manufacturing plants in New York City and vicinity, and a dinner-dance on the evening of Feb. 17.

The following technical papers have been tentatively scheduled for the program:

"Printing Telegraph Systems Applied to the Handling of Commercial and Railroad Telegraph Traffic," by A. H. Reiber.

"Modern Developments in Submarine Telegraph Cable Operation," by J. W. Milnor.

"Condenser Discharge Through General Gas Circuit," by C. P. Steinmetz.

"Questionnaire on Lightning-Arrester Practice," by F. L. Hunt.

"Deviations from Standard Practice in Lightning Arresters," by E. E. F. Creighton.

"Effect of Moisture on Thermal Conductivity of Soils Surrounding Cables," by G. B. Shanklin.

"The Use of Superimposed Imaginary Emfs. and Fluxes in the Solution of Alternating-Current Problems," by V. Karapetoff.

"Wave Form and Amplification of Corona Discharge," by J. B. Whitehead and N. Inouye.

"Questions of the Economic Value of the Overhead Grounded Wire," by E. E. F. Creighton.

"Surge-Proof Windings for Transformers," by J. M. Weed.

"The 'Indumor,' " by V. Karapetoff.

"Heating of Railway Motors in Service and on Test Floor Runs," by G. E. Luke.

Preferred Stocks Prominent in December Financing

THE total amount of stocks and bonds offered investors by the electric light and power companies, which has been increasing so markedly, continued on the upward trend during the month of December. The high total of $66,300,400 exceeds the total for December of last year by over $32,000,000 and that of November by over $12,000,000. Offerings of preferred stock again played a prominent part in the month's flotations. The rate of return yielded the investor, 6.64 per cent, remained comparatively low, though it showed a slight increase over that of November, 6.33 per cent. The largest single issue was that offered by the Philadelphia Electric Company, amounting to $12,500,000.

Name of Company	Amount of Issue	Period	Class of Security	Purpose of Issue	Rate of Interest	Per Cent Yield	Offered At
Durham Public Service Co. (North Carolina)	$100,000	Fifteen-year	General mortgage sinking-fund gold bonds, series A		8	8.10	99¼
Hagerstown & Frederick Ry. Co.	540,000	One-year	Convertible collateral trust notes, series A	Refunding	7½	7.50	100
Connecticut Power Co.	500,000	Five-year	Gold notes		7	7.00	100
Indiana Power Co.	1,100,000	Twenty-year	Non-callable first lien and general mortgage bonds, ser. A	To reimburse company for expenditures for additions to plant	7½	7.50	100
Kansas City Power & Light Co.	2,000,000	Twenty-five year	First and refunding mortgage gold bonds, series C	To reimburse company for expenditures for extensions and improvements	7½	7.40	101
Nevada-California Electric Corp.	1,100,000	Thirty-year	First lien gold bonds, series B		6	6.40	95
Penn Public Service Corp.	750,000	Ten-year	First and refunding mortgage gold bonds, series A		6	6.70	96
Utica Gas & Electric Co.	1,500,000	Three-year	Gold notes	To fund floating debt	7	7	100
Public Service Corp. of New Jersey	10,000,000	Twenty-year	Secured gold bonds	To pay maturing notes	7	7.10	98¾
Philadelphia Elec. Co.	12,500,000	Twenty-year	Refunding and collateral bonds		6	6.05	99
Vermont & Quebec Power Corp. (Richford, Vt.)	300,000	Twenty-year	First mortgage gold bonds		8	8	100
Kentucky Utilities Co.	600,000	Twenty-year	First mortgage lien gold bonds, series B		7	7	100
North American Co.	10,422,400	.....	Common stock		..	..	Par
Consolidated Gas, Electric Light & Power Co. of Baltimore	700,000	.....	Cumulative preferred stock, series A	Reimburse treasury for additions and extensions	8	7.47	107
Queens Borough Gas & Electric Co.	1,533,000	.....	Cumulative preferred stock	Enlarge gas and electric plants	8	..	100
Southern California Edison Co.	7,500,000	.....	Common stock		..	..	97½
Electric Bond & Share Co.	1,250,000	.....	Cumulative preferred stock	General corporate purposes in expanding the business	6	6.75	89
Pennsylvania-Ohio Power & Light Co.	750,000	Ten-year	Secured sinking fund gold notes		8	8.15	99
Columbus Railway, Power & Light Co.	5,000,000	Twenty-year	Refunding mortgage gold bonds	To retire mortgage bonds due and to reimburse company for expend'trs	6	6.60	93½
Washington Water Power Co.	2,000,000	Two-year	Notes	To retire in part notes falling due	6½	6.50	Par
Morris & Somerset Electric Co.	405,000	Nineteen-year	First mortgage sinking fund gold bonds of 1910	Purchase of property	7	7	100
St. Paul Gas Light Co.	1,500,000	Thirty-year	General and refunding mortgage gold bonds, series A		6	6.03	99½
San Antonio Public Service Co.	3,800,000	Thirty-year	First mortgage and refunding gold bonds, series A	To retire bonds falling due. To reimburse company for construction and improvements. To provide funds for further construction and improvements.	6	6.10	98½
Iowa Light, Heat & Power Co. (Carroll)	450,000	Thirty-year	First mortgage sinking fund gold bonds	To reimburse company for expenditures, to reduce floating debt and for other corporate purposes	5+ 2% additional	7.10	98¾
Total	$66,300,400						

Province of Ontario Bonds on a 5.55 per Cent Basis

AN AMERICAN banking syndicate has just purchased from the Province of Ontario $15,000,000 fifteen-year 5½ per cent gold bonds which were offered this week to investors at a price of 99¾. The bonds are non-callable. At the same time a small block of the 6 per cent bonds of the province due in 1943 were offered on a 5.55 per cent basis. These bonds are a direct obligation against all the revenue of the province, including that of the Hydro-Electric Power Commission in Ontario, which has just started the first unit of its new 500,000-hp. plant at Chippawa Falls, estimated to cost at completion more than $80,000,000.

Portland, Ore., May Regulate Its Retail Electrical Dealers

REGULATION of retail stores selling electrical supplies, in order to prevent inferior material being sold, is provided for in an ordinance which will come up for passage before the City Commissioners of Portland, Ore., soon. After an investigation made by L. W. Going, chief electrical inspector of the city, it is said to have been conclusively shown that many small retailers are selling electrical supplies of inferior quality which do not comply with the specifications of the building code and tend to increase the fire hazard. The ordinance provides for a license fee from all dealers in electrical supplies. Cancellation of permits granted is the penalty for selling material not coming up to the specifications of the building code.

American Engineering Council Takes Up Patent Office Conditions

WHEN the American Engineering Council of the Federated American Engineering Societies convened in Washington on Thursday for a two-day session, conditions in the United States Patent Office were one of the chief topics brought up for discussion. The council is co-operating with other agencies in a nation-wide campaign to bring about reforms necessary to the protection of American invention and industry. The deplorable conditions existing in the Patent Office have been once again brought to public attention by Edwin J. Prindle, chairman of the patents committee of the council, who takes issue with the contention of Representative Mondell that the bill for the general reclassification of government positions will take care of the Patent Office. Mr. Prindle urges that the Patent Office relief bill be pushed to a vote. He says, in part:

"Owing to the meager salaries ($2,700 for primary examiners), resignations of Patent Office examiners have been going on steadily for a number of years, until now more than half of the force consists of young men fresh from college. There are more than twenty positions for examiners unfilled because it has not been possible to get men who are qualified to pass the entrance examination to offer their services. At the same time, the work of the Patent Office has increased by leaps and bounds.

"The examining corps, which would be unable to cope with the work even if every man were effective, has been so decimated that the process of disintegration cannot go much further without the Patent Office becoming stalled, both because of the loss of morale and because of its being swamped with work. A few months more of this process of going to pieces will complete its disorganization. As the general reclassification bill, even if it should ever become a law, cannot, by its terms, become effective in less than eighteen months, it would be fatal to drop the Patent Office relief bill and wait for the reclassification bill.

"There are scores of positions in the government service which pay salaries above that proposed for a primary examiner in the Patent Office relief bill ($3,900), and if the services required of primary examiners were only scientific, the proposed salary would still be fully justified. But these examiners must not only have scientific but legal training as well. The engineers believe that the salary proposed for the primary examiners is the very lowest that will keep any considerable proportion of the examiners in the Patent Office and that relief must be given now if disaster is to be averted. The bill, by increasing the fees for patents by $5, much more than provides for the increased expenditure. Thus the Patent Office would under the new bill continue, as it has always been, to be more than self-supporting.

New York Grants Preliminary Permits for St. Lawrence

PRELIMINARY permits have been granted by the New York State Water Power Commission for the development of the St. Lawrence River at Croil Island to the Louisville Power Company and at the Long Sault Rapids to the St. Lawrence Transmission Company. These are the first permits issued under the new state water-power act. Both these developments are being promoted by Col. Hugh L. Cooper, who designed the Mississippi River Power Company's development at Keokuk. The Croil Island plant will have an ultimate capacity of 1,000,000 hp. and the Long Sault plant approximately as much.

The permits are entirely preliminary, with provision for any changes that may be necessary if proposed water-power legislation that is expected to come up at this session of the State Assembly should become law.

No action has been taken as yet by the Federal Power Commission on applications for St. Lawrence development permits. These were held up awaiting the report of the International Joint Commission.

Contracts for Additions to Pittsburgh and New Orleans Plants Announced

ANNOUNCEMENT was made this week of two important contracts in the electric light and power field, one for the installation of the second 60,000-kw. unit at the Colfax plant of the Duquesne Light Company, Pittsburgh, Pa., and the other for the 20,000-kw. addition to the plant of the New Orleans (La.) Railway & Light Company. Both of these contracts were secured by Dwight P. Robinson & Company of New York, who are also engaged in preliminary engineering work on several large developments.

The work for the Duquesne Light Company includes, besides the installation of the 60,000-kw. unit, three additional substations along the company's lines in the Pittsburgh district. The Colfax station is designed ultimately to be one of the largest steam units in the country and to contain six 60,000-kw. units. The first unit was put in operation last year.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Chicago Firm Buys Electric Utility Property in Ohio.—The Northwestern Ohio Light Company of Delphos, Ohio, has sold its Hicksville branch to Cotter & Winslow of Chicago for $225,000.

Power Sent Over Guilford (Me.) Line.—Last month saw the inauguration of service between Lakewood Junction and Guilford, Me., by the Central Maine Power Company. This is a 33,000-volt line, part aluminum and part No. 1 copper. It will form part of a longer line, extending back over the Kennebec River to the Weston station, which will soon be completed.

Dann (N. C.) Municipal Plant Will Be Sold to Utility Company.—The electors of Dann, N. C., have voted to sell the municipally owned electric system to the Carolina Power & Light Company of Raleigh. The contract which was ratified obligates the company to pay the city $45,000 for its plant and lines. The Raleigh company also contracts to bring its own lines into Dann and assume control of the system within ninety days.

Contracts Awarded for Southern Power Plants.—It is announced that contracts have been let by the Southern Power Company both for the hydro-electric power plant at Mountain Islands, N. C., and for the new power house at Great Falls, S. C. The former plant, which will involve the eventual expenditure of $8,000,000, will have a maximum rating of 80,000 hp., and the Great Falls development a rating of 60,000 hp. The projects are scheduled for completion in the next two years.

Relative Advantages of Wire and Radio Service.—Summing up a description of the achievements and advantages of wireless telephony, more especially in the Pacific Coast States, the *Pacific Telephone Magazine* says: "The natural characteristics of radio and wire transmission are fundamentally different. Each, owing to its unique capabilities, is performing a service for which the other is unsuited, and each is supplementing the other to such good effect that all important needs for communication are being met as rapidly as they arise. For the large amount of traffic on land, both telegraph and telephone, which must be handled with certainty and a minimum of cost, the use of wire is necessary. But as an agency for communicating over wide stretches of water, with moving conveyances generally, for a host of maritime and military purposes, and for the broadcasting of information, radio today is rendering services of the greatest value. All considerations point to the conclusion that in these fields its use will become of ever greater importance."

Electricity in British Mines.—The aggregate horsepower of electric motors in use in the mines of Great Britain is put in the official 1920 statistics at 1,080,822, or an increase of 5 per cent over the previous year. The total horsepower under ground was 618,868, while surface motors were rated at 461,954 hp. In addition, motors of 20,045 hp. were employed in metalliferous mines. Charts show, says the London *Electrician*, that the progress in the introduction of electrical machinery has been more rapid in Scotland than elsewhere, and then come the South Wales, the Northern and the Yorkshire and North Midland divisions.

Associations and Societies

Philadelphia Section, A. I. E. E.—"The Philadelphia-Pittsburgh Section of the Philadelphia-Chicago Cable" will be discussed before this section on Jan. 9 by J. J. Pilliod of the American Telephone & Telegraph Company.

Iowa Engineering Society.—The twenty-fourth annual meeting of the Iowa Engineering Society will be held at Sioux City on Jan. 17-20. The headquarters will be in the Woodbury County Court House and there will be exhibits of manufactures and material on an extended scale.

Washington Section, A. I. E. E.—At a joint session of the Washington sections of the A. I. E. E. and A. S. M. E. to be held on Jan. 10 two papers on "Superpower" will be read, one by I. E. Imlay, consulting engineer Niagara Falls Power Company, and the other by Henry Flood, Jr., consulting engineer, New York; N. W. Storer, general manager Westinghouse Electric & Manufacturing Company, and others are expected to discuss the topic.

Coming Meetings of Electrical and Other Technical Societies

A. I. E. E. Section Meetings—Philadelphia, Jan. 9; Washington, Jan. 10; Lehigh Valley, Jan. 12; Baltimore, Jan. 20; New York, Jan. 27; Salt Lake City, Jan. 27.

A. I. and S. E. E. Section Meetings—Philadelphia, Jan. 7; Cleveland, Jan. 14; Pittsburgh, Jan. 21; Chicago, Jan. 27; Birmingham, Jan. 28.

Indiana Public Utility Association—Bloomington, Ind., Jan. 14.

Western Association of Electrical Inspectors—Chicago, Jan. 17-19. (For program see issue of Dec. 17, p. 1243.)

Iowa Engineering Society—Sioux City, Jan. 17-20.

American Society of Civil Engineers—New York, Jan. 18-19.

Association of Municipal Electrical Utilities of Ontario—Toronto, Jan. 26-27.

Lighting Fixture Dealers' Society of America—Milwaukee, Jan. 30-Feb. 2.

New Mexico Electrical Association—Albuquerque, Feb. 13-14.

Pennsylvania State Association of Electrical Contractors and Dealers—Allentown, Feb. 15.

American Institute of Electrical Engineers—Midwinter convention, New York City, Feb. 15-17.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Arizona Corporation Commission's Powers.—In Haddad vs. State the Supreme Court of Arizona has found that though the constitutional function of the Corporation Commission is to regulate "public service corporations" within the state, and not individuals engaged in public service, an order affecting both corporations and individuals is not void as including classes of persons not mentioned in the law. (201 Pac. 847.)*

Telephone Line Owner Not Liable for Injury Caused by Felling Tree.—Affirming a judgment for the defendant in an action for damages (Gillespie vs. Andrews), the Court of Appeals of Georgia declared that the mere fact that the defendant might have allowed his line of telephone wire to touch the limb of a tree could not be taken to have as a natural and probable consequence that some other person would fell the tree across a properly strung line of electric wires six feet above the telephone wire and thereby complete a short circuit. The negligence charged against the owner of the telephone wire was not therefore the proximate cause of the injury for which recompense was sought (108 S. E. 906.)

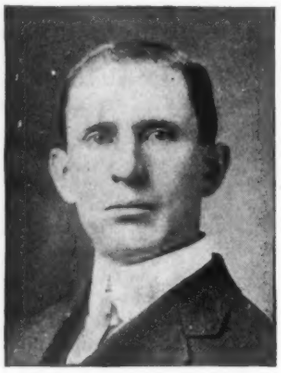
Service at a Loss and Proper Measure of Inability to Pay.—In a suit (North Coast Power Company vs. Kuykendall) where the company's rates to diking districts were found excessive by the Department of Public Works (formerly the Public Service Commission) of the State of Washington, the Supreme Court of that state has found that the burden of showing the rates to be excessive fell on the original complainants since the new tariff had gone into effect before the complaints were made. The rule that where the general business of a public service company is bringing a fair return on the total investment it may be compelled to serve a given class of customers at less than cost was held inapplicable, but it was further held that the measure of a diking district's inability to pay is its actual financial resources and not the estimate of officials who provided for expenses without anticipating a change in rates. Whether the rates of the company are fair cannot be affected by the question of whether it solicited the business or the business was spontaneously offered. (201 Pac. 780.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

Leonard T. Dickinson has been appointed professor of electrical engineering at the University of Vermont,



L. T. DICKINSON

in charge of the electrical engineering department. Professor Dickinson was graduated from the Massachusetts Institute of Technology in 1896. Immediately after graduation he was connected with the American Telephone & Telegraph Company and the General Electric Company for two years, after which he served as instructor in electrical engineering at the University of Maine, Armour Institute of Technology and Massachusetts Institute of Technology. From 1903 to 1909 he was instructor and assistant professor of electrical engineering in Lafayette College, and from 1909 to 1915 he was professor of physics and electrical engineering in Rhode Island State College. In 1919 and 1921 Professor Dickinson was professor of electrical engineering in Robert College, Constantinople, Turkey, and upon his return to this country was appointed professor of electrical engineering in the University of Vermont and put in charge of that department. Professor Dickinson is an associate member of the A. I. E. E. and a member of the Society for Promotion of Engineering Education.

Walter P. Schwabe, vice-president and general manager of the Northern Connecticut Light & Power Company, has been appointed a member of the committee to devise a system of uniform accounting for municipally owned water companies, the committee being named by the Public Utilities Commission of the State of Connecticut. Mr. Schwabe is already a member of the committee on uniform accounting of the New England Water Works Association.

M. H. Gerry, formerly engineer and power superintendent of the Metropolitan West Side Electric Railway, Chicago, has been made secretary, agent and engineer for the St. Anthony Falls Water Power Company and the Minneapolis Mill Company, succeeding William de la Barre, who was elected president. Mr. Gerry was graduated in 1890 from the College of Mechanical Engineering of the University of Minnesota. He was employed for several years by the General Electric Company. For more than twenty years he lived in Montana, where he built the first dam in the Missouri River for the commercial development of power and the original transmission lines to Butte, Anaconda and Helena.

R. I. Baird has returned to the Electric Storage Battery Company after an absence of four years and is now in charge of Western sales of "Exide" batteries, railway car lighting, industrial trucks, etc., with headquarters in the Marquette Building, Chicago. After graduation from the Armour Institute of Technology, Chicago, in 1905, he spent two years with the Automatic Electric Company and worked for some time at Albuquerque, N. M., for this company. Then he

R. I. BAIRD

served with the Bryant Zinc Company and also with the signal department of the Illinois Central until 1909, when he joined the sales department of the Electric Storage Battery Company, Philadelphia. In 1917 he left this company and went to Montana, where he had charge of the territorial office of the Delco Light Company while developing his own ranch interests.

R. W. Stovel, who served overseas as lieutenant-colonel in the A. E. F. in charge of the mechanical and electrical equipment at all ports used by the American forces, has entered consulting engineering practice with H. A. Brinkerhoff in New York City. Mr. Stovel was graduated from McGill University, Montreal, as an electrical engineer in

R. W. STOVEL

1897. From 1898 to 1903 he was with the Pittsburgh & Lake Erie Railroad and from 1903 to 1914 held various positions, including those of mechanical engineer and managing engineer with Westinghouse, Church, Kerr & Company, New York City, and had charge of a large number of railroad electrification and central-station construction undertakings. From 1914 to 1917 Mr. Stovel was with Gibbs & Hill in charge of several railroad electrification projects. After the war he re-entered the employ of Westinghouse, Church, Kerr & Company, later merged with Dwight P. Robinson & Company. Here he remained until he resigned to practice for himself. Mr. Stovel is a member of the A. I. E. E. and an associate member of the A. S. M. E.

T. I. Dekle, who has been with the Westinghouse Electric & Manufacturing Company since 1917, has left to enter the service of the Cline Electric Manufacturing Company, Chicago, as control engineer.

J. B. Straw has taken up his duties as associate professor of electrical engineering at the Agricultural and Mechanical College of Texas. Mr. Straw is a graduate of Purdue University and was connected with the electrical engineering department of the University of Pennsylvania for eight years. He has also done engineering work with the William Gordon Corporation of New York and other engineering concerns.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

Electrical Industry Weathers Hard Year and Now Shows Recovery

A HISTORY of the electrical industry in the year just past is not a chronicle of prosperity, but it does contain many valuable business lessons and much of the wisdom that comes with adversity. It has been a year of struggle between slowly dropping production costs and stationary overhead charges on the one hand and a dwarfed demand and fast-decreasing sales value on the other, and few concerns in the electrical industry or any other for that matter reached the end of the year as well off financially as they entered it. Yet every one that has weathered the storm so far is richer in experience, better fitted to progress rapidly when the opportunity arises again, more efficient in doing current business, and all in all better prepared to go into the markets of the world and compete with all comers, than was the case during the easy times of 1919 and part of 1920.

The year started as one of hope. The depression had got well started during the last part of 1920, and there was a general expectation that conditions would have hit bottom and rebounded by spring. The automobile, textile and some other industries actually did show signs of life for a short time in these early months, but it was not well sustained, and during the first half of the year business sought a low level and activity was negligible.

Competition Replaces Order Taking

The electrical industry, though many companies had gone into the year with orders ahead, was forced more and more to resort to keen competition for all business, to forget the old order-taking days and revive the almost-forgotten art of salesmanship. There were consolations, though, for labor was more amenable and produced more, raw materials were in excellent supply, deliveries were short, and transportation problems had been largely overcome. Production, in short, was no longer a matter of difficulty. Prices of electrical products almost without exception have followed the downward path the whole year, the general policy being to liquidate as fast as costs dropped, and thus small reductions made often have allowed the market to readjust itself without much pain. There were other factors, of course, such as topheavy stocks, the immediate need for cash to meet debts and the demand of the public that prices come down. At the end of the year some electrical goods were down around pre-war levels, and there were few less than 25 per cent below peak quotations. Stocks have been much reduced during the year, and while immediate deliveries may be had in most lines, the inventory period brought little worry with it. Many jobbers and dealers have gone to the other extreme and hand-to-mouth buying is complained of by the manufacturer. Production in the electrical field has varied considerably, but there are few plants working to capacity. Credits and collections have been all-absorbing topics. There is reason to believe collections are now improving, but credits are still watched closely by the manufacturer and because of this losses are being minimized.

General conditions were bad also until early fall. Steel, textiles, agriculture, retail business, building, copper and other metals, railroad loadings, all continued on the downward path. Worst of all, because basic, was agriculture, which with the exception of cotton has not yet recovered to any extent. The most pronounced improvement has been shown by the construction industry. Since August building permits have shown a large increase.

Out of all this misfortune the coming year emerges with reasonably bright prospects. Labor has been partially liquidated, inventories are small, central-station companies are adding heavily to their residential loads, demand is improving somewhat, and building is going ahead rapidly even now. International relations are being adjusted satisfactorily, and this will help in foreign markets. There is no room in the coming months for an unreasoning optimism, but in all quarters there is confidence that 1922 brings opportunity and gradual improvement.

Export Total Below Last Year

Fortunately for the final record, exports in the first three months of the year reached high totals, March establishing a peace-time record. After that there set in a steady decrease, and at the present rate 1921 exports will amount to about $94,000,000, against $102,000,000 last year. Owing to the smaller money value of the articles, this indicates a volume at least equal to last year's. Smaller foreign buying ability, low exchange and the fact that many foreign plants, especially those of Germany, were back in production were factors in the decreased shipments in the later months of the year.

Apparatus Demand Becomes Light

From a condition of heavy bookings and uncertain deliveries the motor market rapidly changed after the year began to one of heavy stocks and light demand. Cancellations were frequent, and even popular sizes from 1 hp. to 10 hp. moved slowly. A general price reduction of 10 per cent was announced in July, and a readjustment of alternating-current motor prices was made around Dec. 1, but this did little to stimulate demand. Since early spring production has been small. During the fall some improvement has been noticed, but shipments may still be had quickly. Second-hand stocks are not so heavy and more new equipment is reaching the purchaser.

Transformers encountered much the same demand as other power apparatus. Back orders had been virtually overcome by early spring, and stocks of distribution transformers, while not burdensome, included virtually all sizes. Prices were reduced 10 per cent in February and 10 per cent again in July on certain makes of distribution transformers, but without much net result in demand. Sales of apparatus transformers were moderate, and deliveries were measured by time of production.

As industrial production fell away, demand for turbines and generators decreased. Central-station companies were hard put to it to maintain their load even with large numbers of residential customers being put on their lines, and there was no need to install much additional capacity. Repair and maintenance demand has held, and here and there new plants are being installed to cover new territory. For the last half of the year deliveries have been normal.

Pole-Line Equipment Much Reduced

Reductions on pole-line equipment, including poles, cross-arms, pins, insulators and line hardware, were frequent during the year, and though the volume of sales was fair, their money value is far below 1920. Western red cedar poles were cut about 18 per cent in April and 15 per cent in December, while Northern white cedars were dropped about 20 per cent in August and 15 per cent in December. Fir and yellow pine cross-arms dropped approximately 30 per cent during the year. Buying of both poles and cross-arms held up surprisingly well during the year, much of it being for central-station repair and maintenance work. Electric railway buying has been small. Producers have

good stocks and are no longer hampered by transportation conditions in making deliveries. The season in the woods is not to be so heavy this year as it was last, producers state. The Far East and South America provided a good market for steel poles and tower.

Porcelain insulator deliveries ranged from three to four months in January but quickly changed to immediate de livery as demand declined. By October sales were starting to increase for the small distribution sizes, though orders are still individually small. Prices were reduced twice during the year, a total of from 15 to 20 per cent. Scattered reductions on line hardware were made a number of times and amounted in all to over 30 per cent. Manufacturers operated all year at from 50 to 75 per cent of capacity.

KEEN COMPETITION IN WIRE

At the beginning of the year the wire market had become the delight of shoppers, and from that time until August buyers were able to obtain many concessions. In the meanwhile quotations slid from around $8.50 per 1,000 ft. of rubber-covered in 5,000-ft. lots to as low as $6.15. Underselling the market ceased to be a novelty. But by the middle of the year unwieldy stocks had been reduced and a firmer copper market aided in bringing better conditions for wire-drawers and distributers. Production of No. 14 rubber-covered increased in September and it has sold well since. In December quotations had come back to around $6.60 per 1,000 ft. in New York. Conditions in the weatherproof field were much the same, and quotations have risen to 16 to 16¾ cents per pound in the last month.

Bare wire base fell to 13.25 cents per pound in August, and though not a very large demand has sprung up since, its price followed the copper market to 15.25 cents in December. Magnet wire has been a drug on the market most of the year, for many motor manufacturers, spurred on by the shortage in 1920, obtained heavy stocks a year ago and still have good supplies. Lamp cord and heater cord returned to the market in good supply early in the year and may be easily obtained in quantity.

PIPE BUYING HAND-TO-MOUTH

There has been little margin of profit on rigid conduit all year. Purchasing has been of a most cautious nature, and the practice of local price-cutting has been observed frequently. The lower steel market fortunately has helped manufacturers keep production costs down, and quotations in New York on ½-in. black in twelve months fell from $70 per 1,000 ft. to around $48.50. Stocks of all sizes are plentiful in contrast with last year's shortages.

INCREASING CONSTRUCTION HELPS WIRING MATERIALS

The gradual resumption of building during the summer aided schedule-material manufacturers in maintaining good sales. Supplies of raw material were better than in 1920, labor conditions in the factories were considerably improved, and some producers operated at or near full capacity from the middle of the summer on. Drops averaging from 10 to 20 per cent went into effect during the year, but there was not the general price cutting here observed in other lines.

FLEXIBLE ARMORED CONDUCTOR REACTED FROM SLUMP

Stocks of armored conductor at the beginning of the year were heavy, but manufacturers have been fortunate in encountering a steady demand throughout the fall, and deliveries now range from three to four weeks, with a few plants reporting bookings for six weeks. Prices are close to pre-war levels, and with more manufacturers in the field than in 1913 competition is strong. The No. 14, two-wire, single-strip is currently quoted in New York at around $45 per 1,000 ft. in 1,000-ft. lots, as against a quotation of $65 to $70 last January.

LAMP PRODUCTION HELD DOWN

Shortly after the first of the year lamp sales were so strongly affected by general business conditions that the "Mazda" lamp companies started operating on a four-day-week basis. By spring the seasonal recession in sales was unusually noticeable, though small agents' business was holding up well, indicating more residential and less industrial lighting. Fall brought little improvement. Stocks of consumers are pretty well used up by this time, though, and the lamp companies are on a better basis of production. Stocks of B agents have been complete all year. Gas-filled-type lamp sales have been astonishingly good owing to street lighting and electric sign activity. Prices on this type were reduced somewhat on Oct. 1. A few minor changes in lamp listing were effected May 1, dealing with diffusing-bulb lamps and candelabra decorative lamps. At the beginning of the year a new selling plan for miniature "Mazda" lamps went into effect, permitting agency appointments to be given only to wholesale distributers with a fixed basic compensation for services to the manufacturer. A revised discount schedule was arranged for retail distributers.

SMALLER APPLIANCES HAVE FAIR SALES

The smaller appliances, such as toasters, irons, curling irons, percolators, etc., met with favor in a year when the public was inclined to be careful with its money. Irons had perhaps the best sales. Vacuum cleaners and washing machines partly recovered from the slump of last fall, reaction being due in part to generous reductions.

Fractional-horsepower motors were to be had in any quantity at low prices, and conditions in that field were chaotic for months. Improvement has been shown this fall, and motor-driven appliance manufacturers have bought moderately.

METALS UP IN LAST HALF YEAR

Copper did not falter in the descent which was well started on the first of the year, and in August reached a price of 11½ cents a pound, lower than it had gone since 1914. There the turning point was reached, and slowly and painfully it struggled back a quarter of a cent at a time. In November the threat of a rail strike sent it back to 12 cents, but later in the month it rallied, and it is now at 14¼ cents. Early in the year mining was largely shut down to give the surplus a chance to find a market. Sales since September have been good, and the surplus of 1,250,000,000 lb. at the beginning of the year is now close to a normal supply. Resumption of mining is looked for in the spring. The formation of the Copper Export Association in the early spring aided greatly in resuscitating copper export trade and the year's foreign buying reached a large total.

	Dec. 27, 1920	Dec. 31, 1921
Copper:	£ s. d.	£ s. d.
London, standard spot	72 5 0	66 2 6
	Cents per Pound	Cents per Pound
Prime Lake	13.75	13.87½
Electrolytic	14.00	13.75
Casting	13.00	13.00
Wire, base	16.00–16.50	15.00–15.25
Lead, Am. S. & R. price	4.75	4.70
Antimony	5.25	4.50
Nickel, ingot	43.00	41.00
Sheet zinc, f.o.b. smelter	11.50	8.50
Zinc, spot	6.00–6.10	5.15–5.20
Tin, straits	33.00	33.12½
Aluminum, 98 to 99 per cent	28.50	19.00
OLD METALS		
Heavy copper and wire	11.00–11.50	11.50–11.75
Brass, heavy	6.00–6.50	5.25 –5.50
Brass, light	4.50–5.00	4.87½–5.00
Lead, heavy	3.50–4.00	4.00 –4.12½
Zinc, old scrap	3.25–3.50	2.50 –2.75

Copper-wire base, net, at the mill reached its lowest point, 13.25 cents at the beginning of September, and gradually came back to its current quotation, 15.50 cents, one cent lower than a year ago.

Lead prices fluctuated between 4 cents and 5 cents all year, and the metal touched its low point, 4 cents a pound in New York, in March, long before copper reached its ratio. In May producers obtained 5 cents a pound but were unable to hold this price, and lead declined gradually to 4.40 cents in July. On Oct. 1 it climbed to 4.70 cents and held this price to the end of the year.

The steel market has shown a downward tendency all year, and producers claim that steel liquidation is about finished. Actual movement of steel for 1921 has been better than was expected, the estimate of total ingot production being around 20,000,000 tons. The collapse of the shipbuilding industry was the worst blow suffered. Prospects for 1922 are good, particularly in the export market.

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

THE last week of the year proved as dull as the week before had been busy. Retail demand for socket appliances receded from its high-water mark of the previous week, and taking of inventories made hand-to-mouth buying by dealers and jobbers imperative. Inventories are expected to show very small carryovers of the small socket appliances, such as toasters, percolators, irons, grills, etc., while stocks of most wiring materials are comfortable. Jobbers are of the opinion that it will take two weeks for demand to reassert itself and that after Jan. 15 the march back to prosperity will be resumed.

There have been no important price changes reported, outside of those noted in the ELECTRICAL WORLD last week. High spots, too, are few.

NEW YORK

As could be expected, the week between Christmas and New Year's was comparatively quiet in the electrical trade after the rush of holiday business the week previous. The demand for wiring supplies has moderated somewhat, but in view of the fact that this is the inventory period, orders have held up well. Most jobbers and contractors are busy closing up the year's business, and little activity is looked for until after the middle of the present month. Indications are that building is on the increase, and jobbers are receiving requests for bids on large quantities of materials. At least one large order was placed this week for the material necessary for "roughing in" a big job.

No important price changes were announced with the first of the year. In fact, jobbers have been rather slow in adjusting their conduit prices to cover the additional warehousing charge on rigid iron conduit placed by the manufacturers on orders delivered from warehouses.

Credit conditions are improving slowly, and the large accounts which have been outstanding for several months are being gradually whittled down. New accounts are opened only after very careful scrutiny, and current billings are on a thirty-day to sixty-day basis.

Conduit.—Some jobbers have not as yet adjusted their prices on this material to take care of the additional warehousing charge announced in the ELECTRICAL WORLD last week. Prices quoted this week ranged as follows: For ½-in. black pipe in 2,500-ft. lots, $44 to $46; ¾-in., $56 to $59, and 1-in., $80 to $85 per 1,000 ft. Galvanized pipe in the same sizes and quantity was quoted respectively from $48.50 to $51, $62.50 to $66 and $89.50 to $94 per 1,000 ft. Jobbers have fair stocks and report a moderate demand.

Rubber-Covered Wire.—The demand for rubber-covered wire has improved slightly and orders are for larger quantities. There appears to be a general sentiment that quotation on this material will be seen at higher levels. No. 14 rubber-covered is quoted at $6.50 to $6.93 per 1,000 ft. in 5,000-ft. lots. Jobbers' stocks are fair to good.

Flexible Armored Conductor.—No change in price on this material was reported this week. No. 14, two-wire, single-strip, is quoted at $45 per 1,000 ft. and double-strip at $47 per 1,000 ft. in lots of that quantity. Demand continues active and jobbers' stocks are only fair.

Metal Molding.—Jobbers carry small stocks as a rule and demand is light. In 1,000 ft. lots the three-wire size is quoted at $5.60 per 100 ft.

Lamp Cord.—Quotations on this material have remained unchanged for some time, probably because of the large stocks on some jobbers' hands. No. 18, cotton, twisted, is quoted at $12.90 per 1,000 ft. and the parallel at $15.60 per 1,000 ft. in lots of that quantity.

Heating Appliances.—Holiday business left most jobbers with small stocks of heating devices to carry over. In fact, there is some shortage of toasters and percolators. The slight price reductions on some appliances which became effective on Dec. 31 will make little difference in inventory figures.

Schedule Material.—Demand is fairly active in line with other wiring supplies. No price changes have been reported. Key sockets in standard package lots of 500 are quoted at $18.15 per 100 and keyless in the same quantity at $16.50 per 100. Pull sockets in lots of 250 are quoted at $33 per 100.

CHICAGO

During the past week more attention has been paid by electrical dealers to the inventory situation than to anything else, although in a few cases strong after-Christmas buying has been reported. But in the majority of cases jobbers and dealers are taking a breathing spell and are examining the sales results of 1921 and planning activities for 1922. A large number of dealers are satisfied with the total volume of Christmas sales; although it was not equal to sales for 1920, they feel that, in view of past conditions of trade, a good showing was obtained. The general spirit is one of optimism tempered by conservatism, and it is held that 1922 business will come to him who fights for it.

During this inventory period wiring materials have slumped a little and a slight increase in the price of copper wire has been noted. A fair demand for silk lamp cord has been reported, possibly to facilitate arrangements of new Christmas appliances. One manufacturer of heating appliances reports an average reduction of about 11 per cent on his goods. Inquiries on high-tension substation equipment by anthracite coal-mine companies were active during the week, and one manufacturing company reports a similar interest shown by public utility companies for extending transmission lines for farm-lighting projects.

Wire.—Rubber-covered No. 14 has stiffened a bit and is quoted at $6.75 to $7 per 1,000 ft. in 5,000-ft. lots. The call for weatherproof had a slight drop, but it is going fairly well at 16¾ cents a pound in 1,000-lb. lots. A few jobbers have increased the bare-wire base, while others feel that they should give the purchasers a slight inducement to buy and accordingly have not changed the price.

Flexible Armored Conductor.—Jobbers, in general, report a decreased activity and no increase of price has been noted, although expected. No. 14 two-wire, double-strip, sells for $46 to $48 per 1,000 ft. in 5,000-ft. lots.

Conduit.—A few jobbers have reported a good movement on conduit, but as a whole this material has not kept up its recent movement. It sells in 5,000-ft. lots for $47 per 1,000 ft.

Heating Appliances.—The final Christmas rush for these appliances was very satisfactory and in some cases continued into the following week. Jobbers and dealers everywhere reported a very brisk sale of flat-irons, toasters, open-air heaters and curling irons which continued right through the holiday period. This action might have been produced by an 11 per cent reduction on these appliances by one prominent manufacturer. It may also be possible that some people waited until after Christmas in order to obtain better bargains. However, the majority of dealers had sufficient stocks to supply this trade and thereby reduced their inventories.

Lamp Cord.—A continued demand for silk lamp cord has been noted this week, possibly to supply extensions for wiring of newly received appliances. No. 18, silk, twisted, sells for $27.50 per 1,000 ft., while this same size in parallel wire sells for $30 per 1,000 ft.

Meters.—Movement of meters increased a little last month. An increase of 3 per cent over November in sales of watt-hour meters for houses was noted in December.

BOSTON

The new year opens in the trade with widespread confidence tempered by the expectation of gradual improvement. Jobbers have reduced their stocks probably at least 50 per cent in the past year and a half and, in the faster moving lines tied into domestic service, are in good shape to resume buying more actively as conditions improve. The final week of 1921 was dull as is usual for the post-Christmas inventory period. Reports of holiday trade show that in the lower-priced socket heating devices rush shipments by manufacturers saved the day on deliveries, many retailers having underestimated the extent of buying which developed in the final week before Dec. 25. Prices last week underwent little change in Boston jobbing circles. Residential building is still under way in this district.

Conduit.—Fair sales are taking place from week to week. Stocks are readily meeting requirements. Prices are easy, representative figures on ½-in. black in 2,500-lb. lots being $49.21 per 1,000 ft. and $90.77 for the 1-in. size. Galvanized pipe, ½-in., sells at $53.82 per 1,000 ft., and 1-in., galvanized at $99.96, in the foregoing quantities, per 1,000 ft.

Fixtures.—Sales are spotty, but encouraging. Improvements in mercantile establishments are absorbing considerable material, and the residential market is showing moderate activity. Stocks are still widely diversified, and intelligent sales effort is reaping the reward which is its due.

Wire.—Moderate wire movement is reported, rubber-covered selling at $6.75 per 1,000 ft. in 5,000-ft. lots. Weatherproof base is 16½ cents. Occasionally a little bare copper wire moves out of the reel yard or distributer's basement to piecemeal line-extension jobs.

Porcelain.—Sales do not indicate anything exciting in prospect just yet, but fair buying of knobs and tubes appears now and then to parallel the wire demand. "Nail-it" knobs sells in barrel lots at $18.50 per 1,000 and tubes in barrel lots at $6.20 and $13 per 1,000 in the 3-in. and 6-in. sizes respectively.

Flexible Armored Conductor.—This material is moving enough to satisfy a moderate demand only, with very close competition in prices. In 2,500-ft. lots single-strip sells from $43 to $45, delivery from Boston stock. Enough such material is still in hand to lead jobbers in some cases to cut quotations very close to the line in order to move it.

Lamp Cord.—Replacement orders come in to swell an otherwise non-spectacular demand. Fair quantities are moving. No. 18 cotton-covered cord sells at $17.50 per 1,000 ft. in 1,000-ft. lots. Appliance sales are a constant factor in stimulating the growth of diversified lamp-cord business, for new and for repair applications.

Sockets.—Trade is not bad in these as the year closes. Prices are steady, case-lot sales going as follows: Pulls, 31½ cents net; keys, 18 cents, and keyless, 16½ cents. A little more ordering for stock in January is not unlikely among far-sighted jobbers.

Appliances.—Shelves are pretty well cleared of the lighter and less expensive appliances. Very heavy demands on jobbers and even on manufacturers' stocks were made by retailers at the end of the pre-Christmas period. Prices are a little easier on flat-irons, percolators, etc., effective Jan. 1. The opinion is advanced in jobbing circles that present prices of standard devices of this type should encourage a more active non-seasonal trade in the near future.

ATLANTA

The last ten days have shown a remarkable improvement in the retail lines. Up to the close of business Christmas Eve the trade reported business in excess of anticipations, especially in toys, Christmas-tree outfits, heating devices and portables. As a result the carryovers in these lines will not be so heavy as was expected a few weeks ago. This week witnessed a very marked decrease in the amount of orders received by jobbers, due, of course, to the fact that no purchases are being made by contractors except for urgent needs, these orders being mostly for construction materials. All electrical firms are busy on inventory and other matters preliminary to winding up the year's business.

Canvass of the jobbing trade results in the impression that in the months of January and February, 1922 orders will be received mostly from the larger centers, with only a small volume of trade to be expected from the rural districts. Conditions are expected to improve in the small cities around March 1. A number of large industrial projects are reported under serious consideration awaiting action of directorates about the first of the year. No sharp price reductions are anticipated in the immediate future; in fact, heating-device prices already announced show no material cuts. Local jobbers have pulled stocks down to a very fair basis, most of it being on the thirty to sixty day turnover.

Electric Hoists.—Construction of industrial and commercial buildings has stimulated the market, and manufacturers report a very satisfactory volume of orders and inquiries, a number of these being for coal handling and dock equipment.

Electric Elevator Equipment.—Considerable activity is reported in this line, the volume of sales throughout the district for several months past being very satisfactory. A majority of the machines are of the freight type, though a fair quantity of orders for traction and high-speed passenger machines for office buildings have been received. A number of inquiries for installations subsequent to Jan. 1 are reported, with prospects for early closing good.

Industrial Motors.—The amount of business of one of the largest distributers shows considerable increase, particularly in the 220-volt and 550-volt sizes of 50-hp. and the 550/2,300-volt synchronous type in excess of 50-hp., the majority of the latter type going to raw-water ice installations. Shipments vary from stock to six weeks.

Lamps.—All jobbers report the lamp business for the last quarter of 1921 as showing an increase over the same period of 1920. Sales of the round bulb frosted, and to a lesser degree of the white bulb, have been satisfactory, while the bowl-enamel, type C lamp is rapidly increasing in popularity. In the "Mazda" class, the 25, 40 and 60-watt types lead in the volume of sales.

Transformers.—The demand continues fair to good in distributing transformers of 200-kw. sizes and under. There is a growing tendency to abandon a general use of the very small transformers, the 5-kw. to 25-kw. sizes coming more into popularity. Stocks are in good condition.

Fans.—The fan prices for 1922 have just been announced and show an approximate reduction of 10 per cent from the prices of last year. No orders are being received for spring delivery as yet, but sales campaigns are being mapped out by a number of jobbers, who report prospects to be as good as those of this time last year.

ST. LOUIS

On account of the holidays last week and the fact that many of the business concerns were busy with inventory taking, jobbers found business quiet. Stocks of electrical goods—wiring materials as well as appliances—have been well reduced during the year, and the new year finds them on a very conservative basis. For a time stocks of some items were short, but suitable replacements have been made, and virtually all orders, except those of great magnitude or for special materials, can be immediately filled from St. Louis stocks.

It is very encouraging to note increased attention being given by industrial concerns to improvements in their power systems. Competition is enforcing more economical manufacturing, and the central-station companies are taking advantage of this condition to demonstrate to the manufacturers the economy of purchasing power. A few plants in St. Louis are now converting, many others have signified their intention to change as soon as business conditions permit, and the same situation is reported to exist throughout the territory. This field will afford a most important outlet for electrical materials until construction of new plants becomes more extensive. In fact, any electrical device that will promote economy will be viewed with

favor by the managers of industrial plants, provided that the initial cost is not excessive.

Wire.—Close attention is being given price adjustments. The market is becoming more firm as stocks purchased at the lower prices become less. The base for bare is about 15 cents per pound, and that for weatherproof is 16½ cents per pound. A representative quotation on No. 14 rubber-covered is $7 per 1,000 ft. in 5,000-ft. lots and $6.87 per 1,000 ft. in 10,000-ft. lots. Sales for the week were quiet, and stocks are in very good condition. The greater portion of the sales are of No. 14 rubber-covered, for residential work.

Loom.—Stocks were heavy, but have been reduced to a conservative basis. The demand has slackened appreciably in the last few weeks. The $\frac{7}{32}$-in. size is selling for $16 per 1,000 ft., and the ¼-in. size for $17.50 per 1,000 ft., both in 5,000-ft. lots.

Portable Drills and Hammers.—Sales must await a reduction in building costs to reach a satisfactory volume. A new ¼-in. drill has just been placed on the market to sell for $55.

Sockets.—A steady demand of good volume has persisted, and stocks are in excellent condition. Representative prices are: Key, $18.15 per 100; keyless, $16.50 per 100, and pull, $33 per 100.

Pliers.—Storm and sleet conditions have strengthened sales to some extent, though as a whole the demand is quiet. Klein's 6-in. side-cutting pliers are selling for $2.80 per pair, and the same plier in the 8-in. size sells for $3.75.

Flexible Armored Conductor.—No appreciable change in the demand is found, but some improvement is expected soon after the first of the year. Stocks are being maintained as conservatively as possible. No. 14, two-wire, double-strip, is selling at $45 to $52.50 per 1,000 ft. in 5,000-ft. lots.

Outlet Boxes.—The demand is steady but somewhat less than might be expected. Stocks are conservative, yet complete. The 3¼-in. round box sells for $7.20 in the black and for $8 in the galvanized.

PORTLAND—SEATTLE

Business in general is quiet following Christmas trade, and stores are attempting to bolster up trade by offering very exceptional price reductions. The general outlook for business in the Northwest during the coming year is good. Already large domestic orders for lumber for early delivery have been booked, and mills which have made the usual shutdowns for repairs over the holidays are planning to open up again by the first of the year.

Electrical trade during the past week has been fairly quiet, following a week of active holiday trade. The latter was very satisfactory, the volume of sales and their value comparing very favorably with and in many cases exceeding those of last year. This week the stocks in certain lines are badly demoralized as a result of heavy Christmas buying and understocking on the part of the retailers. This is particularly true of household appliances and certain hollow-ware items, such as waffle irons, toasters, coffee urns, grills, etc. Most jobbing houses are virtually closed this week on account of taking inventories. Some jobbers report that there was an unusual demand for high-priced goods, while others report that the majority of sales of holiday goods were in medium-priced lines. Nevertheless the best-grade urn-type percolators, Sheffield plateware, and the better-grade waffle irons were exhausted, in some cases several days before Christmas. On the other hand, Christmas tree outfits did not move so fast as was expected except in the case of Japanese goods. The market was flooded with Japanese Christmas lamps that sold at retail lower than the American goods could be purchased at wholesale. These goods apparently have the reputation of standing up very satisfactorily, and their appearance completely demoralized the sale of higher-priced goods in this line. Retail electrical stores report volume of sales greater than last year and ranging anywhere from 75 per cent to 125 per cent of last years sales' in value.

Stocks of heating appliances in general were well cleaned out, and most stocks are well balanced at the present time. Some Christmas-tree outfits will be carried over, but the stock in general is not heavy. Contracting in Portland is reported good, and prospects for the year are excellent.

The general tendency in prices is toward small reductions on everything with the possible exception of rubber-covered wire which shows a tendency to strengthen in Portland.

Lamp Cord.—All cord wires show a slight reduction in price. Seattle quotes No. 18 twisted-pair, cotton-covered, at $11.97 per 1,000 ft. and No. 18 twisted-pair, silk-covered, at $28.48 per 1,000 ft. Stocks are in good shape.

Rubber-Covered Wire.—Quotations in Seattle are: No. 14, $7.40 per 1,000 ft. in 5,000-ft. lots; No. 18 fixture wire, $4.35 per 1,000 ft. The demand is good and stocks are ample.

SAN FRANCISCO

Although electrical jobbers and dealers are striving to look facts squarely in the face and are not regarding 1922 prospects with any unjustified optimism, yet there is a more cheerful tone among the people generally. California depends largely upon the sale of agricultural products for prosperity, and 1921 crops not only brought good prices, but during the year many of the 1920 surpluses were cleaned up satisfactorily. This meant renewed prosperity for the districts which had been rendered stagnant while these surpluses existed. Building prospects are good, for there is a large amount of unreleased work in the hands of architects. The last year proved the futility of certain methods of appliance solicitation, so that 1922 will build on that dearly acquired experience. It will be a year of competition because of high stocks on the Coast and big stocks in Eastern factories which must be moved, but it is the general opinion that it will not be a disappointing year because it has been foreseen and provided for.

Heating Appliances.—Prices on some makes have been reduced and they are now selling in the 6½-lb. size for $7.50 each, list. There is a new selling schedule working out at about 30 per cent for flat-irons in case lots and 35 per cent in four-case lots, with a parallel schedule on other household appliances in lots of one and in lots of six respectively. Heating appliances sold quite well during the holiday season. Many last-minute purchases of fairly large lots were reported with a continual tendency on the part of dealers to cut their purchases to the smallest amount consistent with a fair discount.

SALT LAKE CITY—DENVER

The best news from this section is the announcement that most of the idle mines in Montana will resume operations Jan. 16. This includes properties of the Anaconda Copper Mining Company, Butte & Superior Mining Company, Tuolumne Copper Company, North Butte Mining Company and several others. A horizontal wage decrease of 50 cents a shift will go into effect. Whether this favorable action presages a general revival of the metal industry of the West is not certain. The announcement, however, has awakened widespread interest and is sure to have a favorable effect on general business conditions.

Governors of a half dozen Intermountain states have just completed a conference at Salt Lake City in which they considered recommendations to be made to the Interstate Commerce Commission at a hearing on the freight rate question to begin Jan. 11 at Washington, D. C. The commission will be appealed to for a reduction of freight rates on basic commodities produced in the West.

Electrical Dealers are beginning the year with stocks at low ebb. They have little of their capital tied up in merchandise and will probably continue to pursue the policy of small orders and intensive selling along the lines where there is least resistance. Holiday selling was generally satisfactory and has resulted in building up a small working reserve. In many cases jobbers are laying plans for sales conventions and will launch determined drives for an augmented volume of sales in 1922.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

Southern Electric Starts Fuse Production

The Southern Electric Manufacturing Company, Bristol, Tenn., it has been announced, started production of inclosed fuses, plug fuses, fuse links and cut-out porcelains on Nov. 1 last. The company was formed earlier in the year, being incorporated in Tennessee and backed by men with long experience in the electrical industry in the South. A factory was obtained at 619-621 Shelby Street, Bristol, in August and shipping commenced on Nov. 1. The output of the factory is at present 5,000 plug fuses and 2,500 inclosed fuses per day, but, according to a statement made to the ELECTRICAL WORLD by William M. Nelson, general manager of the company, provisions have been made to enlarge production on short notice. Distribution is being obtained through district sales agents in the larger cities and through direct-by-mail advertising campaigns.

Plans Maturing for St. Louis Electrical Show

Arrangements for the electrical show to be given in the St. Louis Coliseum March 20 to 25, under the auspices of the St. Louis Electrical Board of Trade, are being made definitely. General E. J. Spencer, secretary-manager of the Board of Trade, will be directly in charge of the operation of the show, and according to General Spencer the number of reservations on hand at present indicates that the success of the show will be complete. There are 156 exhibit spaces, and of these over 60 per cent have already been taken. Arrangements have been made to include manufacturers in the show, and a number of interesting exhibits have been secured by those in charge.

Direct Sales for Green Company in Chicago

The Green Engineering Company, East Chicago, Ind., manufacturer of chain-grate stokers, steam-jet ash conveyors, cast-iron hoppers and ignition arches, has opened a direct branch sales office at 941 Monadnock Building, 53 West Jackson Boulevard, Chicago. The former agency representation has been discontinued in the Chicago district. The change was made, according to the announcement of the company, in order to maintain better service and closer relations with the company's business friends in the district.

J. W. Himmelsbach has been appointed district manager, with supervision over sales in northern Illinois, northern Indiana, Iowa and Michigan. P. Albert Poppenhusen, president of the company, will maintain an office at the Chicago address. The general sales office will remain at the factory.

Whiting Controls Grindle Fuel Equipment Company

A controlling interest in the Grindle Fuel Equipment Company, Chicago, manufacturer of powdered-coal equipment for use with steam boilers, malleable furnaces, etc., has been purchased by the Whiting Corporation, Harvey, Ill. The Whiting Corporation manufactures electric traveling cranes, hoists and other handling machinery. The headquarters of the Grindle company have been moved to Harvey, but the name of the company will not be changed and the business will be handled on the same plan as before. The equipment for the Grindle company will be manufactured by the Whiting Corporation. Officers of the Grindle company as reorganized have been elected as follows: President, S. H. Whiting; vice-president and general manager, A. J. Grindle, and secretary and treasurer, T. S. Hammond.

Retail Fuse Sales Stimulated by Manufacturer

The increased use of electrical appliances in the home, according to Henry D. Sears, general sales agent of the Weber Electric Company, has brought with it an increased demand for plug fuses by the householder. Considerable attention has been given by the company during the past few months to business of this character, and to assist dealers in handling retail sales at a profit it has designed a fuse card of substantial thickness, about 6 in. square, and holding two 30-amp. fuses for the main service cut-out and eight 10-amp. fuses for branch circuits. These cards are being furnished to dealers, one being inclosed in each carton of 10-amp. and 30-amp. fuses, the thought being that certainly not more than 20 per cent of all the fuses of those two capacities that are produced by the manufacturer are turned over at retail. The card is provided with a brass eyelet so that it can be hung in a convenient place. If more than half the holes are empty, it is a reminder to the householder that it is time to have it refilled.

Canadian Manufacturer to Make Electric Vibrating Screens

The Stimson Equipment Company, Salt Lake City, Utah, has leased the rights to the Canadian manufacture and sales of its electric vibrating screens to the Engineering Equipment Company, Montreal. Manufacture of the screens will be carried on in that city. James W. Davis, formerly with the Canadian Ingersoll-Rand Company, has been appointed sales manager of the Engineering Equipment Company.

Bussman Announces Sales Department Changes

Changes of personnel and office location have been announced by the Bussman Manufacturing Company, manufacturer of "Buss" fuses, St. Louis, Mo. H. V. Flora has recently been appointed as factory representative in direct charge of sales for the States of Minnesota and Wisconsin. The appointment is now in effect, and Mr. Flora's offices are in Milwaukee. A. F. Fitzsimmons has been transferred to the Cincinnati territory with headquarters there, while the Chicago office has been transferred to 29 South Desplaines Street.

Underwriters' 1921 Electrical Work Equals 1920 Volume

During the year the work of the electrical department of the Underwriters' Laboratories, Inc., has been of about the same volume as in 1920 but has been spread over a somewhat larger number of items, according to an announcement just made. The applications received have not been for so large a number of what may be described as standard wiring devices as in some previous years but have included a very wide variety of special appliances. Among those which have been dealt with by the electrical department are water-heating devices, special forms of fixtures, toys, hairdressing outfits and many small machines for special industrial purposes. An item of significance is the growing activity of foreign manufacturers in seeking a market in this country for their wares. This applies particularly to Belgium, Germany and Japan, also to some extent to England. Samples of such products as originally submitted are usually of a quality decidedly sub-standard as compared with listed devices of the same class made by American manufacturers.

"The number of devices received," the statement continues, "from the Pacific Coast directs attention to the increasing use of electricity for cooking and heating whenever low service charges are established. Through the Underwriters' Laboratories industry conference on rubber-covered wires and cords a standard on a new form of portable cord known as rubber-sheathed cord (type S) has been developed. This cord with its jacket of a high-grade

rubber and without braided coverings is expected to prove very useful where the conditions of service are severe.

"With the co-operation of manufacturers, plans have been completed for a standard on Christmas-tree lighting outfits with the result that hereafter a better grade of such devices will be available, free from some of the defects heretofore observed. A large amount of work has been done on new lines of inclosed switches produced in response to the widespread objection to the old 'open knife switch.' Special testing machines for these switches have been designed and installed in the Laboratories.

"While the volume of work on fuses has not been so great as in 1920, the fuse-testing equipments in Chicago and New York have been extensively used both on new designs and in retesting under the label service. The Electrical Safety Conference, of which the Laboratories is a member, has issued its safety standard for industrial control equipment and will shortly issue others on rotating electrical machinery, cranes, switchboards, oil-switches and oil circuit breakers."

Westinghouse Obtaining Power Equipment Business

Slightly increased business activity is noticed by the Westinghouse Electric & Manufacturing Company, which has received two large orders for power equipment within the last few weeks. One of these orders, for four large booster converters, four large transformers and auxiliaries and amounting to $120,000, was placed by the Brooklyn Edison Company, New York. The other, for rotary converters and transformers for two substations, was received from the city of Philadelphia. This amounted to $100,000. All this equipment will be built at East Pittsburgh, the work to begin at once.

A very good demand for radio equipment, particularly around Chicago, where opera is being broadcasted, is reported by the Westinghouse Company and production has slightly increased.

Electric Motor Repair Company Moves Into New Quarters

Increasing business during 1921 has led the Electric Motor Repair Company, Springfield, Mass., to seek new and larger quarters at 15 Park Street, Springfield. J. B. Tufts, treasurer, stated to the ELECTRICAL WORLD this week that in the new location the company will have improved facilities for testing and repair work on motors and generators and that a better departmental arrangement has been secured, with greater accessibility for customers. Looking forward to 1922, Mr. Tufts expressed confidence in the further development of preventive maintenance practice in industrial establishments and the ability of engineering to meet the requirements of better service in the coming year.

Stovel-Brinkerhoff Engineering Company Formed

R. W. Stovel and H. A. Brinkerhoff, both formerly with Westinghouse, Church, Kerr & Company for some period during their previous engineering work, have formed a partnership as consulting engineers with headquarters at 136 Liberty Street, New York City. The company, under the firm name of Stovel & Brinkerhoff, will handle design, construction and equipment of electric and steam power stations, factories and railroad shops and investigations and reports on factories and power plants and on the purchase and generation of power.

Phillips Electrical Works to Have Brockville Plant

The first contract for the construction of the plant of the Eugene F. Phillips Electrical Works, Ltd., electrical wire manufacturers at Brockville, Ontario, Canada, has been let and work will proceed immediately, according to word received from that city. The company's original plant is at Montreal. The contract is in connection with the construction of the pumping station intake pipe and other work preliminary to the main plant. Work will be started on it at once. The pumping station is to be of brick and concrete construction. Bids are now being invited for the construction of the factory building, which it is estimated will cost about $40,000.

Wetmore-Savage Sales Conference Optimistic Toward 1922

Department heads, executive officers and affiliated manufacturing representatives of the Wetmore-Savage Company assembled at the Boston City Club Dec. 28 for conference, the meetings lasting three days. The principal topics discussed were the recent advances in electrical apparatus and appliances which can be featured in 1922 sales. The general opinion was that a gradual improvement in business is to be expected this year, followed by a decided acceleration in trade in the latter part of the year. Besides representatives of Wetmore-Savage, the principal speakers included J. F. Lamb and F. J. Wachter, vice-presidents Landers, Frary & Clark, New Britain, Conn.; B. G. Kogamanhoff, general sales manager, and J. F. Patrick, New England sales manager, Benjamin Electric Manufacturing Company, New York; J. H. Trumbull, president, Frank Wheeler, vice-president, and L. L. Brastow, sales manager, Trumbull Electric & Manufacturing Company, Plainville, Conn.; W. W. Mumma, general sales manager Robbins & Myers Company, Springfield, Ohio; James Tuohey, New England representative Holophane Glass Company, Newark, Ohio, and Messrs. Stryker, Moore and A. W. Marcou of the Bryan-Marsh Division National Lamp Works, Boston.

The Save Electric Corporation, 254 Thirty-sixth Street, Brooklyn, N. Y., has filed notice of increase in capital stock from $250,000 to $1,050,000.

The Wireless Improvement Company, 18 Broadway, New York City, has filed notice of increase in capital stock from $150,000 to $400,000.

The Packard Electric Company, Warren, Ohio, announces the removal of its Buffalo office to 502 Marine Trust Building. Merle D. Summer, district manager, has been placed in charge.

The Stevens Sales Company, distributers of motors, pumps and lamps and handling a general line of such electrical apparatus and equipment of standard type, has moved to its new home at No. 134 West Second South Street, where it has more commodious quarters, including a well-equipped office and warehouse.

The Jarvis Storage Battery Company, 229 South Liberty Street, Winston-Salem, N. C., recently organized with a capital of $50,000, has purchased a site on which it proposes to erect a plant, with a capacity of 600 units per week, for the manufacture of farm-lighting-plant and automobile storage batteries.

The W. A. Jones Foundry & Machine Company, Chicago, manufacturer of power-transmitting machinery, has appointed F. E. Holtz as its Milwaukee distribution representative, with headquarters in the First National Bank Building there. The appointment is to take effect at once.

The Maher Engineering Company, 30 North Michigan Boulevard, Chicago, has appointed C. B. Adams as vice-president and sales manager and C. H. Peterson as secretary-treasurer and general manager. The company has just been made the representative of the Atlas Valve Company, Newark, N. J., in Chicago and also in Detroit, where the offices are located at 744 David Whitney Building.

The Betson Plastic Fire Brick Company, Rome, N. Y., has placed C. Z. Dillenbeck in charge of its Chicago office at 1,514 Kimball Building. L. S. Shaw & Company, 5,716 Euclid Avenue, Cleveland, Ohio, have recently been appointed general agents and distributers in Michigan, Ohio, Indiana, Kentucky.

The Ideal Commutator Dresser Company, Chicago, manufacturer of commutator resurfacers, has established district sales offices in New York, at 1,905 Tribune Building. A full line of samples will be carried there, the company states. The office will be in charge of R. W. Becker.

The Combustion Engineering Corporation, Combustion Engineering Building, New York, has opened a branch office at 806 First National Bank Building, Pittsburgh, Pa. The new office will be in charge of W. C. Stripe, formerly manager of the Philadelphia office of the company.

Foreign Trade Notes

SUBURBAN RAILWAY LINES IN BOMBAY, INDIA, TO BE ELECTRIFIED.—An extensive scheme, the *Electrician* states, has been adopted for the electrification of the Bombay (India) suburban lines.

ELECTRIFICATION OF RAILROAD IN NORTHERN ONTARIO.—Investigation of complete electrification of the Temiskaming & Northern Ontario Railway, with particular reference to the proposed extension from Cochrane north to Oil Can Portage, has been decided upon by the Railroad Commissioners.

ELECTRIFICATION OF RAILWAYS IN SOUTH AFRICA.—The electrification of the Durban-Pietermaritzburg Railway between Pietermaritzburg and Glencoe, a distance of 171 miles, according to the *Electrician*, has been definitely decided upon by the South African Railways and Harbors Board. The direct-current system at 3,000 volts will be used, and the total cost is estimated at between £3,000,000 and £4,000,000.

MERGER OF HYDRO-ELECTRIC COMPANIES IN FRANCE.—A group has been formed by a number of hydro-electric companies under the name of Société de Transport d'Energie du Centre, according to the *Electrician*, for the purpose of establishing a large system for the distribution of electricity in the southeast of France and the Massif Central. The headquarters of the new company are at Saint-Etienne.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An importing firm in Norway (No. 464) desires to secure an agency for the sale of electrical cooking and heating apparatus.

An engineer in Switzerland (No. 467) desires to secure an agency for the sale of steel wire and other articles in steel, iron brass or copper, tools, new systems and electrical apparatus.

New Apparatus and Publications

ELECTRIC SIGN.—The Mitchell Advertising Company, Cincinnati, has placed on the market an electric sign, "Mov-A-Long," designed for use in show windows.

MOTOR-GENERATOR SET.—A small two-bearing motor-generator set, equipped with switchboard mounted on the set, for private or public battery charging, signal work or plating, has recently been placed on the market by the Electric Specialty Company, Stamford, Conn.

RUBBER BELTING.—The New York Belting & Packing Company, 91 Chambers Street, is distributing a booklet covering its "Test Special Rubber Belting."

PIPING SYSTEM.—Bulletin W-11, published by the M. J. Dougherty Company, Twenty-fifth and Washington Avenues, Philadelphia, contains interesting comments on the importance of the piping system and the value of proper design and erection.

TRACTOR.—The Mercury Manufacturing Company, 4118 South Halsted Street, Chicago, is distributing a small bulletin entitled "The Trackless Train for Textile Mills," describing its new "Mercury" type K electric tractor, designed particularly for the textile industry.

RIVET HEATERS.—The United States Electric Company, New London, Conn., is distributing bulletin No. 6, describing and illustrating various types of electric rivet heaters.

WATER HEATER.—The United States Electric Company, New London, Conn., is distributing a four-page leaflet covering its "Economy" instantaneous electric water heater.

GENERATORS.—Circular 3439, recently issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., describes its "EV" type of alternating-current, vertical water-wheel-driven generators.

SWITCHES.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently developed and is now manufacturing an improved line of indoor disconnecting switches, known as type "S." These switches are available in front-connected types as high as 66,000 volts and rear connected types as high as 25,000 volts, single-throw and double-throw.

New Incorporations

THE NEW LONDON ELECTRIC COMPANY, Lancaster, Pa., has been incorporated with a nominal capital stock of $5,000 by John H. Ware, Jr., Oxford; R. F. Simons and J. Guy Eshleman, Lancaster. The company proposes to operate an electric light and power system.

THE SHELL ROCK (IA.) ELECTRIC LIGHT AND POWER COMPANY has been incorporated with a capital stock of $300,000. C. L. Gotshall, 208 South La Salle Street, Chicago, is president.

THE KORENA BUSINESS DEVELOPER COMPANY, New York, N. Y., has been incorporated by J. D. Korena, R. Perry and L. Berrington. The company is capitalized at $100,000 and proposes to manufacture electrical devices. J. A. O'Brien, 1402 Broadway represents the company.

HEWITT & RICHARDSON, INC., Brooklyn, N. Y., has been incorporated with a capital stock of $10,000 to manufacture radio and other electrical equipment. The incorporators are J. K. Hewitt, G. D. Murray, Jr., and A. P. Nevin, 30 Church Street, New York City.

THE DIAMOND WIRE COMPANY, Buffalo, N. Y., has been incorporated by Herbert T. Dyett, Frank M. Potter and Harry W. Barnard, all of Rome. The company is capitalized at $300,000 and proposes to manufacture electrical wires and cables.

THE DOERING ELECTRIC SPECIALTY COMPANY, Atlantic City, N. J., has been incorporated with a capital stock of $20,000, to manufacture and deal in electrical specialties. The incorporators are Joseph Milligan, Arch Davis and Oscar F. Ross, 206 Humphries Building.

Record of Electrical Patents

Notes on United States Patents

(Issued Dec. 13, 1921)

1,399,728. AUTOMATIC SWITCH FOR TELEPHONE-EXCHANGE SYSTEMS; Arthur H. Adams, Galion, Ohio. App. filed July 26, 1919.

1,399,760. FIRE-ALARM SYSTEM; Manious Garl, Akron, Ohio. App. filed Aug. 20, 1920. Normally closed-line circuit.

1,399,775. COMMON-BATTERY SUBSTATION; Kenneth S. Johnson, Jersey City, N. J. App. filed Feb. 1, 1918. Telephone substation.

1,399,801. CIRCUIT BREAKER FOR REVERSIBLE MOTORS: Lester E. Samuel, Brownsville, Ore. App. filed April 17, 1920. To operate window shades, window sashes, fire doors, revolving shutters, etc.

1,399,832. DYNAMO-ELECTRIC MACHINE; Henry H. Wait, Chicago, Ill. App. filed Aug. 23, 1917. For lessening noise occasioned by rotating armatures.

1,399,852. REGULATOR FOR FURNACE ELECTRODES; Waldemar Dyrssen, New York, N. Y. App. filed Dec. 12, 1919. Hoisting and regulating mechanism.

1,399,853. PORTABLE ELECTRIC LIGHT AND POWER PLANT; Charles H. Ferguson, Valhalla, N. Y. App. filed Dec. 27, 1919.

1,399,857. TROLLEY CLAMP; Arthur L. Freret, Ensley, Ala. App. filed Sept. 22, 1921. Readily assembled.

1,399,877. SOUND GENERATOR; Michael I. Ppin, Norfolk, Conn. App. filed Feb. 4, 1918. For generating compressional waves.

1,399,899. CONVERTIBLE PLATE OR COVER FOR ELECTRICAL RECEPTACLES; Joseph P. Sontgerathe and Raymond Kale, Cherryvale, Kan. App. filed Jan. 18, 1921. Convertible face plate.

1,399,931. ELECTRIC FAN HEATER; Joseph C. Clutts, Fort Thomas, Ky. App. filed Nov. 23, 1920.

1,399,945. RADIO TELEGRAPHY; Harold F. Elliott, Palo Alto, Cal. App. filed July 24, 1920. Continuous-oscillation radio telegraphy.

1,399,968. ELECTRICAL MEASURING DEVICE; Otto A. Knopp, Oakland, Cal. App. filed March 1, 1917. To overcome ratio error and phase-angle error of instrument transformer.

1,399,983. MOTOR-CONTROL APPARATUS; Alexander J. Nicht, Jr. App. filed Aug. 23, 1919. To change relative speeds at which sets of rolls are operated.

1,399,988. AUTOMATICALLY ADJUSTABLE TENSIONING DEVICE; Frank M. Pierce, Chicago, Ill. App. filed April 29, 1920. For use in wrapping and unwrapping machines.

1,399,989. HORIZONTAL-SHUTTLE WRAPPING MACHINE; Frank M. Pierce, Chicago, Ill. App. filed Nov. 13, 1920. Applying tape, etc.

1,399,991. SHORT-CIRCUITING MEANS FOR ARMATURE WINDINGS; Edward I. Pearson, Toledo, Ohio. App. filed Jan. 19, 1921. Operated by fluid pressure.

1,399,993. PRINTING TELEGRAPH; Harry Pfannenstiehl, East Orange, N. J. App. filed Jan. 23, 1919. Receiving apparatus.

1,399,995. NEGATIVE PLATE FOR ELECTRIC ACCUMULATORS; Adolfo Pouchain, Turin, Italy. App. filed Sept. 18, 1919. Zinc.

1,399,996. NEGATIVE PLATE FOR ELECTRIC BATTERIES; Adolfo Pouchain, Turin, Italy. App. filed Feb. 11, 1920. Zinc.

1,399,997. TELEGRAPH SYSTEM; Paul M. Rainey, Glen Ridge, N. J. App. filed Jan. 3, 1918. Device for storage of signals.

1,399,998. TELEPHONE SYSTEM; Arthur Raynsford, New York, N. Y. App. filed Nov. 25, 1919. Signaling arrangements.

1,400,001. X-RAY TUBE; Thomas B. Rider, Los Angeles, Cal. App. filed Jan. 22, 1919.

1,400,005. HOLDER FOR THE GLOWERS OF TUNGSTEN LAMPS; Otto Schaller, Sudende, near Berlin, Germany. App. filed Oct. 27, 1916. Tungsten wires having an addition of 0.25 per cent of thorium oxide.

1,400,018. ELECTRICAL MEASURING INSTRUMENT; William M. Bradshaw, Wilkinsburg, Pa. App. filed June 13, 1917. Demand meter.

1,400,035. TELEGRAPH SYSTEM; Amos F. Dixon, Newark, N. J. App. filed Nov. 20, 1917. For driving distributers in synchronism.

1,400,038. COIL TERMINAL; Henry C. Egerton, Passaic, N. J. App. filed April 26, 1918. To prevent breaking fine wire.

1,400,039. SIGNALING SYSTEM; Henry C. Egerton, Ridgewood, N. J. App. filed Dec. 27, 1918. Impulses for synchronizing purposes.

1,400,047. SINGLE-PHASE ALTERNATING-CURRENT COMMUTATOR MOTOR; George H. Gascelon, Swissvale, Pa. App. filed Aug. 11, 1917. Squirrel-cage winding of inherent reactance.

1,400,050. SIGNALING SYSTEM; Bertram B. Grace, Upminster, England. App. filed Sept. 5, 1918. Vibrating diaphragm.

1,400,059. BATTERY TERMINAL; Alda F. Hawkins, Fort Worth, Tex. App. filed Aug. 2, 1919. Fastened by less than quarter-turn of nut.

1,400,075. TELEPHONE EXCHANGE SYSTEM; Charles W. Keckler, Newark, N. J. App. filed Aug. 11, 1917. Selective party-line signaling.

1,400,076. TELEPHONE SIGNALING SYSTEM; Charles W. Keckler, Newark, N. J. App. filed Dec. 16, 1919. Automatically discontinuing.

1,400,077. MOTOR-CONTROL SYSTEM; Harold L. Keith, Wilkinsburg, Pa. App. filed Dec. 14, 1918. For automatically accelerating motors.

1,400,085. VIBRATORY-DIAPHRAGM SIGNALING DEVICE; Duncan A. McConnell, Arlington, N. J. App. filed April 24, 1918.

1,400,092. CONTROLLING DEVICE; F. D. Newbury, Pittsburgh, Pa. App. filed Feb. 4, 1918. Controlling force proportional to quotient of two forces.

1,400,101. PANTAGRAPH TROLLEY; William Schaake, Pittsburgh, Pa. App. filed Sept. 16, 1918. Controlled by pneumatic means.

1,400,103. ARTIFICIAL BUSY CIRCUITS; Dawson M. Taggart, East Orange, N. J. App. filed Sept. 4, 1919. For use with trunks.

1,400,113. AUDIBLE ALARM AND INDICATION APPARATUS; George E. and Harold Washington, Manchester, England. App. filed June 25, 1919. Audible alarm at predetermined times.

1,400,116. METHOD OF WRAPPING AND MEANS FOR PRACTICING THE SAME; William M. Wheildon, Ashland, Mass. App. filed April 6, 1918. Tire-wrapping machine.

1,400,120. TELEPHONE-EXCHANGE SYSTEM; Samuel B. Williams, Jr., Brooklyn, N. Y. App. filed April 17, 1918. Automatic switches.

Construction News

Projects, Plans, Bids and Contracts Contemplated or Under Way

New England States

SPRINGFIELD, MASS.—Plans have been filed by Meekins, Packard & Wheat, Inc., Main Street, for extensions and improvements to the power house at their factory.

Middle Atlantic States

ALBANY, N. Y.—Plans have been prepared for increasing the output of the electric plant of the Municipal Gas Company from 15,000 kw. to 32,000 kw. A 17,000-kw. turbine will be installed. Alexander Anderson is chief of the electric power department of the company.

BROOKLYN, N. Y.—The Brooklyn Edison Company, it is reported, will ask for bids early in February for the construction of an electric generating plant at the foot of Sixty-sixth Street, to cost about $1,200,000. G. L. Knight, 360 Pearl Street, is engineer.

LONG ISLAND CITY, N. Y.—Plans have been filed for the construction of a one-story power house at the factory of Lind Mathews, Inc., 243 Thirteenth Avenue.

NEW YORK, N. Y.—Estimates prepared by Daniel L. Turner, chief consulting engineer for the Rapid Transit Commission, 49 Lafayette Street, place the cost of electrical and other operating equipment for the proposed river-to-river moving platform under Forty-second Street at $3,000,000. The total cost of the project is estimated at $7,500,000.

NEW YORK, N. Y.—Bids, it is reported, will soon be received by the U-Need Ice Company, 2050 Amsterdam Avenue, for the construction of an ice plant at Inwood Avenue, to cost about $250,000. Koch & Wagner, 32 Court Street, Brooklyn, are architects and engineers.

TRENTON, N. J.—The Raritan Valley Hydro-Electric Company has been granted permission by the Board of Public Utility Commissioners to issue $20,500 in stock, part of the proceeds to be used for extensions and improvements.

HARRISBURG, PA.—A petition has been submitted to the City Council for improvements to the lighting system on North Cameron and other streets in Harrisburg.

PHILADELPHIA, PA.—Bids will be received at the office of the Construction Quartermaster, Frankford Arsenal, until Feb. 8 for the completion of power plant, including the installation of equipment.

PITTSBURGH, PA.—Tentative plans are under way by the Philadelphia Company, Pittsburgh, operating the Pittsburgh Railways, for extensions and improvements to its car shops and barns, additional track and line construction, power improvements, etc. Arrangements are being made by the company to secure the sum of $5,000,000, part of which will be used for the above work.

HAGERSTOWN, MD.—Plans are under way by the City Council for the construction of a municipal electric power plant, to cost about $300,000. Bids, it is reported, will be asked for early in the spring. C. E. Davis is clerk. A. B. Grubmeyer, 21 East Franklin Street, is engineer.

WASHINGTON, D. C.—The Bureau of Yards and Docks, Navy Department, Washington, D. C., will receive bids until Jan. 18 for the construction of underground utilities at Bellevue, D. C. (Specification 4530.)

North Central States

DETROIT, MICH.—The Belle Isle & East Side Creamery Company has had plans prepared for the construction of a one-story power house, 38 ft. x 60 ft. Warner Brothers, 1111 Kresge Building, are architects.

CINCINNATI, OHIO.—The Lion Light, Heat & Power Company, recently incorporated, plans to furnish power to the Lion Building, Fifth and Elm Streets, exclusively.

CLEVELAND, OHIO.—The City Council has adopted a resolution authorizing extensions to the ornamental lighting system on Lorain Avenue from West Fifty-seventh Street to West 117th Street, and on Clark Avenue from West Fourteenth Street to Lorain Avenue.

DAYTON, OHIO.—The Terminal & Cold Storage Ice Company is having plans prepared for the construction of an eight-story refrigerating and cold-storage plant at Eaker and Ludlow Streets, to cost about $500,000. The G. B. Bright Company, 103 Marquette Building, Detroit, Mich., is architect.

NEWARK, OHIO.—The American Gas & Electric Company, 30 Church Street, New York City, has tentative plans under consideration for the erection of a 220,000-volt transmission line connecting its Windsor (W. Va.) plant with the Newark (Ohio) plant. Electricity will be furnished to Zanesville and other cities along the route. The cost of the line is estimated at $1,250,000.

LOUISVILLE, KY.—The United Casket Company, 3,022 West Chestnut Street, is planning the construction of a one-story power house to be used in connection with a proposed extension, 100 ft. x 450 ft., to its plant.

INDIANAPOLIS, IND.—The Orange County Public Service Company has filed notice of an increase in its capital stock from $86,000 to $200,000.

CAIRO, ILL.—Bids will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until Jan. 24 for conduit and wiring changes, lighting fixtures, etc., in the United States post office and custom house at Cairo, Ill. James A. Wetmore is acting supervising architect.

HARVEY, ILL.—Tentative plans are under consideration for the construction of a new power plant to cost about $10,000 at the local works of the Wyman-Gordon Company, manufacturer of forgings, 332 South Michigan Avenue, Chicago. Nothing definite has been decided upon.

MILWAUKEE, WIS.—The construction of a municipal electric power plant in conjunction with the new sewage disposal plant on Jones Island is recommended by D. W. Hoan Mayor.

BEDFORD, IOWA.—A new company is being organized by J. H. Baker and J. J. Clarke for the purpose of constructing an ice-manufacturing and cold-storage plant, to cost, including equipment, about $200,000.

MUSCATINE, IOWA.—Plans are under consideration by the Council for the construction of a municipal electric light and power plant, to cost about $250,000.

Southern States

WINSTON-SALEM, N. C.—Bids will be received by James G. Hanes, Mayor, until Jan. 18 for the construction of the Richard J. Reynolds memorial white and colored annexes, the Sterling Smith annex and alterations and additions to the present hospital building. Separate bids will be received at the same date and place for plumbing work, electric wiring, elevator work, heating work, etc.

ATLANTA, GA.—Plans are under consideration by the Georgia Railway & Power Company for extensive additions and improvements to its system, including the completion of the 80,000-hp. Tugalo plant, about half finished, to cost about $2,000,000; increase in the capacity of the Morgan Falls plant to 22,500 hp., about $400,000; erection of additional high-tension transmission lines, $2,000,000; development of the Mathis-Tallulah Seed and Burton projects, $2,000,000, and extensions and improvements to electric and gas distributing systems, street-car service, etc., about $2,000,000. H. M. Atkinson is chairman of the board of directors.

FORT MEADE, FLA.—The Town Council has decided to obtain electricity for Fort Meade from the proposed electric light plant to be erected by J. G. Fancy and associates. The plant will cost about $10,000.

ORLANDO, FLA.—The City Council is considering issuing $500,000 in bonds for the purchase of the plant of the Orlando Water & Light Company.

BRISTOL, TENN.—The city of Bristol, it is reported, has purchased a site on the Holston River about 9 miles southeast of Bristol, near Fish Dam, for power development.

MOBILE, ALA.—The Standard Gas & Electric Company, 208 South La Salle Street, Chicago, Ill., which controls the Mobile Electric Company, has plans under consideration for the construction of an electric power plant in the vicinity of Mobile, Ala., to cost about $400,000.

MERIDIAN, MISS.—The power plant of the Meridian Light & Railway Company, it is reported, has been acquired by the city authorities.

DONALDSONVILLE, LA.—The Municipal Light and Water Commission expects to purchase within the next sixty days another oil-engine generating set of about 150 kva. capacity. L. A. Tucker is superintendent in charge.

NEW ORLEANS, LA.—The date of bids to be received by R. M. Murphy, Commissioner of Public Finances, City Hall, for furnishing and installing incinerator equipment of the Decarie type, including electric traveling crane and electric generating equipment complete, has been extended to Jan. 17.

TULSA, OKLA.—W. E. Page, manager of the Sand Springs Light & Power Company, and a number of business men in Tulsa have been granted two franchises, one at Ramona and the other at Ochelata, in connection with the erection of a high-tension transmission line from Avant to Ramona and from there to Ochelata, a distance of about 12 miles. Equipment required will include 500 30-ft. poles with 6-in. tops, 500 four-pin cross-arms, 1,500 13,000-volt insulators, 35 miles of No. 6 bare copper wire, transformers, meters and miscellaneous hardware. Address all correspondence to W. E. Page, 1618 East Fifteenth Street, Tulsa.

WILSON, OKLA.—The City Council is considering improvements to the municipal electric light plant and the installatoin of an ornamental lighting system. Equipment, including a 400-hp. engine, boiler, etc., will be required.

HALLETTSVILLE, TEX.—Bids will be received by the city until Jan. 12 for improvements to the municipal electric light plant, including the installation of a steam engine, switchboard panel, horizontal tubular boiler with steel casing, stack and fittings, water heater, boiler-feed pumps, interconnecting pipe fittings, etc. S. M. Kuykendall is city secretary.

Pacific and Mountain States

MODESTO, CAL.—Arrangements are being made by the Modesto Irrigation District for the sale of its eighth issue of Don Pedro bonds, amounting to $181,600, the proceeds to be used for the construction of power plant.

TURLOCK, CAL.—Arrangements are being made by the Turlock Irrigation District for an issue of $1,028,000 in bonds for the construction of a power house and distribution system.

SAN DIEGO, CAL.—Plans have been completed by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for the installation of cold-storage and refrigerating equipment at San Diego, Cal. Applications accompanied by a deposit of $10 may now be filed for plans and specifications (4543), and necessary data for bidding will be forwarded in the near future. All communications should be addressed to the chief of the Bureau of Yards and Docks.

Canada

WINNIPEG, MAN.—In a report to be submitted to C. D. McPherson, Minister of Public Works, by Joseph Rochetti, Power Commissioner, the amount required for construction work of the Manitoba hydro-electric power system for 1922 is estimated at $2,000,000. The work will require the erection of 150 miles of transmission line. Power extensions have been requested by the towns of Gladstone and Charleswood.

NORTH BAY, ONT.—The Temiskaming & Northern Ontario Railway Company is considering investigating the possibility of complete electrification of its railway system and the construction of a new line from Cochrane to New Post. It is estimated that about 500,000 hp. can be developed on the Abitibi River, as well as several waterfalls on Ottawa, Montreal and Sturgeon watersheds. S. B. Clement, North Bay, is chief engineer.

TECUMSEH, ONT.—The Council is considering submitting to the ratepayers a bylaw authorizing securing electricity from the Hydro-Electric Power Commission of Ontario.

Miscellaneous

PANAMA.—Bids will be received at the office of A. L. Flint, general purchasing officer, Panama Canal, Washington, D. C., until Jan. 11 for furnishing watt-hour meters, meter-sealing wires and rotating meter-testing standards. (Circular 1464.)

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, J. P. Ross, Birmingham Railway, Light & Power Co., Birmingham, Ala.

AMERICAN ASSOCIATION OF ENGINEERS. Secretary, C. E. Drayer, 63 East Adams St., Chicago, Ill.

AMERICAN ASSOCIATION OF OPERATING ENGINEERS. Secretary. H. C. Bristol, Calderwood, Tenn.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Executive secretary, J. W. Welsh, 8 West 40th St., New York City.

AMERICAN ELECTROCHEMICAL SOCIETY. Acting secretary, A. D. Spillman, Lehigh University, Bethlehem, Pa.

AMERICAN ENGINEERING STANDARDS COMMITTEE. Secretary, P. G. Agnew, 29 West 39th St., New York City.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS, INC. Secretary, F. A. Molitor, 143 Liberty St., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York City. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country. Midwinter convention, New York City, Feb. 15-17.

AMERICAN PHYSICAL SOCIETY. Secretary, Dayton C. Miller, Case School of Applied Science, Cleveland, Ohio.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary-treasurer, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

AMERICAN WELDING SOCIETY. Secretary, M. M. Kelly, 29 West 39th St., New York City.

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ASSOCIATED MANUFACTURERS OF ELECTRICAL SUPPLIES. General secretary, C. E. Dustin, 30 East 42d St., New York City.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, Preston S. Millar, 80th St. and East End Ave., New York.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, John F. Kelly, Empire Building, Pittsburgh, Pa.

ASSOCIATION OF MUNICIPAL ELECTRICAL UTILITIES OF ONTARIO. Secretary, S. R. A. Clement, 190 University Ave., Toronto. Semi-annual convention, Toronto, Jan. 26-27.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Joseph A. Andreucetti, Chicago & Northwestern Railway, Room 413, C. & N. W. Terminal Station, Chicago, Ill.

BRITISH COLUMBIA ELECTRICAL CO-OPERATIVE ASSOCIATION. Field Manager, R. E. Chatfield, 108 B. C. Electric Bldg., Vancouver, B. C.

CANADIAN ELECTRICAL ASSOCIATION, affiliated with N. E. L. A. Secretary-treasurer, Eugene Vinet, Shawinigan Water & Power Co., Montreal, Canada.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary-treasurer, Miss Minnie B. W. Baker, 900 15th St., Denver, Col.

ELECTRIC HOIST MANUFACTURERS' ASSOCIATION. Secretary-treasurer, E. Donald Tolles, 165 Broadway, New York City.

ELECTRIC POWER CLUB. Secretary, C. H. Roth, 1410 West Adams St., Chicago, Ill.

ELECTRICAL MANUFACTURERS' CLUB. Secretary, F. L. Bishop, Hartford Faience Co., Hartford, Conn.

ELECTRICAL MANUFACTURERS' COUNCIL. Executive secretary, Frederic Nicholas, 522 Fifth Ave., New York City.

ELECTRICAL SAFETY CONFERENCE. Secretary, Dana Pierce, 25 City Hall Place, New York City.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION, ATLANTIC DIVISION. Secretary, E. Donald Tolles, 165 Broadway, New York City.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION, PACIFIC COAST DIVISION. Secretary, Albert H. Elliot, 502 Flatiron Building, San Francisco, Cal.

ELECTRICAL TRADE ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Canada.

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Printed in the First Issue of Each Month

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ILLINOIS STATE ELECTRIC ASSOCIATION. Secretary-treasurer, R. V. Prather, 305 Illinois Mine Workers Bldg., Springfield, Ill. Meeting, Chicago, March 15-16.

ILLUMINATING ENGINEERING SOCIETY. General secretary, Clarence L. Law, 29 West 39th St., New York City. Sections in New York, Philadelphia, Chicago and Boston. Chapters in San Francisco, Cleveland and Toronto.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England.

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NATIONAL COUNCIL LIGHTING FIXTURE MANUFACTURERS. Secretary, Chas. H. Hofrichter, 23. Gordon Square Bldg., W. 65th and Detroit Ave., Cleveland, Ohio.

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NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive manager, M. H. Aylesworth, 29 West 39th St., New York City.

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NEW MEXICO ELECTRICAL ASSOCIATION. Secretary-treasurer, Charles E. Twogood, Albuquerque, N. M. Annual convention, Albuquerque, Feb. 13 and 14.

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NORTHWEST GEOGRAPHIC DIVISION, N. E. L. A. Secretary-treasurer, J. F. Orr, Idaho Power Co., Boise, Idaho.

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OKLAHOMA UTILITIES ASSOCIATION. Manager, H. A. Lane, 1106 First National Bank Bldg., Oklahoma City.

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SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. Assistant to the president, W. L. Goodwin; secretary-treasurer, R. F. Paige, 522 5th Ave., New York City. Annual meeting second Tuesday in May; directors' meetings second Tuesday in May and November; executive committee meetings every sixty days.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

SOUTHEASTERN GEOGRAPHIC DIVISION, N. E. L. A. Secretary-treasurer, Charles A. Collier, Georgia Railway & Power Co., Atlanta, Ga.

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WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, E. S. Nethercut, 1735 Monadnock Block, Chicago, Ill.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, W. M. Chester, 1408 First National Bank Bldg., Milwaukee, Wis.

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